

Human genes (HUM) and their mappings (UAMs) in Orangutans

IGHV4-80

GENE ALIGN SEQ

HUM:	A	T	G	A	A	A	A	C	C	T	G	T	G	T	T	C	T	T	C	C	T	C	C	C	C	T	G	G	T	G	G	C	A	G	C	T	C	C	C	A	G	A	A	G	T	G	A				
UAM:	G	T	G	A	A	A	G	G	C	C	T	G	T	G	G	T	T	C	T	T	C	C	T	C	C	C	C	T	G	G	T	G	G	C	A	A	C	T	C	C	C	A	G	A	T	G	T	G	A		
HUM:	G	T	G	T	C	T	C	C	A	G	G	A	T	G	C	A	G	A	T	A	T	G	A	A	G	A	T	A	T	G	G	G	A	G	G	C	T	G	C	A	T	C	T	G	A	G	C	C	C	A	
UAM:	G	T	G	T	C	T	C	T	A	G	G	A	T	G	C	A	G	A	T	A	T	G	A	A	G	A	T	A	T	G	G	G	A	G	G	C	T	G	C	A	T	C	T	G	A	T	C	C	C	A	
HUM:	G	G	G	C	T	C	A	C	A	G	T	G	G	G	T	C	T	C	T	G	T	G	T	T	C	A	C	A	G	G	G	G	T	C	C	T	G	T	C	C	C	A	G	G	T	G	C	A	G	C	
UAM:	G	G	G	C	T	C	A	C	T	G	T	G	G	G	T	C	T	C	T	C	T	G	T	T	C	A	C	A	G	G	G	G	T	C	C	T	G	T	C	C	C	A	G	G	T	G	C	A	G	C	
HUM:	T	G	C	A	G	G	A	G	T	G	G	G	G	C	C	C	A	G	G	A	C	T	G	G	T	G	A	A	G	C	C	T	T	C	G	G	A	G	A	C	C	C	T	G	T	C	C	C	T	C	
UAM:	T	G	C	A	G	G	A	G	T	G	G	G	G	C	C	C	A	G	G	A	C	T	G	G	T	G	A	A	G	C	C	T	T	C	G	G	A	G	A	C	C	C	T	G	T	C	C	C	T	C	
HUM:	A	C	A	T	G	C	G	C	T	G	T	C	T	C	T	G	G	T	G	A	C	T	C	C	A	T	C	A	G	C	A	G	T	G	G	T	A	A	C	T	G	G	T	G	G	A	G	C	T	G	
UAM:	A	C	C	T	G	C	G	C	T	G	T	C	T	C	T	G	A	T	G	A	C	T	C	C	A	T	C	A	G	C	A	G	T	G	G	A	A	A	C	T	G	G	T	G	G	A	T	C	T	G	
HUM:	G	G	T	C	C	G	C	C	A	G	T	C	C	C	-	C	A	G	G	G	A	A	G	G	G	G	C	T	G	G	A	A	T	G	G	A	T	T	G	G	A	T	A	C	A	T	C	T	A	T	
UAM:	A	G	T	C	C	G	C	C	A	G	-	C	C	C	T	C	A	G	G	G	A	A	G	G	G	G	C	T	G	G	A	A	T	G	C	A	T	T	G	G	G	T	A	C	A	T	T	A	T		
HUM:	T	A	T	A	G	T	G	G	G	A	G	G	A	G	C	T	A	C	T	A	C	A	C	C	C	C	G	T	C	C	C	T	C	A	G	G	A	G	T	T	G	A	G	T	C	A	C	C	A	T	
UAM:	T	A	T	A	G	T	G	G	G	A	G	C	A	G	C	T	A	C	T	A	C	A	C	C	C	C	G	T	C	C	C	T	C	A	G	G	A	G	T	T	G	A	G	T	C	A	C	C	G	T	
HUM:	G	T	C	A	A	T	A	G	A	A	A	C	G	T	C	C	A	A	G	A	A	C	C	A	G	T	T	T	T	C	C	C	T	G	A	A	G	C	T	G	A	G	C	T	C	T	G	T	G	A	
UAM:	G	T	C	A	G	T	A	G	A	C	A	C	G	T	C	C	A	A	G	A	A	C	C	A	A	G	T	T	T	T	C	C	C	T	G	A	A	G	C	T	G	A	G	C	T	C	T	G	T	G	A
HUM:	C	C	G	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
UAM:	C	C	G	C	C	G	C	T	G	A	C	A	C	C	G	C	C	G	T	G	T	A	T	T	A	C	T	G	T	G	C	G	A	G	A	G	A	C	A	C	A	G	T	G	A	G	G	G	A		
HUM:	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	A			
UAM:	C	G	T	G	A	G	T	G	T	G	A	G	C	T	C	A	G	A	C	A	C	A	A	A	C	A	T	C	C	C	T	G	C	A	A	-	-	-	-	-	-	-	-	-	-	-	-	-			

D7

HUM:	G	G	G	A	G	G	C
UAM:	G	G	A	G	G	C	G

D9

HUM:	G	C	T	C	A	G	G	A	C	C	A
UAM:	C	T	C	A	G	G	A	C	C	A	G

IGHV3-79

GENE ALIGN SEQ

HUM:	A	T	G	G	A	G	T	C	T	G	G	G	C	T	G	A	G	C	T	G	G	G	T	T	T	C	A	C	A	G	T	T	G	T	T	A	T	T	T	T	A	A	A	A	G	G	T	A	A	A
UAM:	A	T	G	G	A	G	T	T	T	G	G	G	C	T	G	A	G	T	T	G	G	G	T	T	T	C	A	C	A	G	T	T	G	T	T	A	T	T	T	T	G	A	A	A	G	G	T	A	A	A
HUM:	C	C	A	G	A	G	A	A	A	T	A	G	A	G	T	G	T	G	A	G	T	G	A	A	T	A	T	A	T	T	T	G	A	G	A	G	A	A	C	A	G	T	G	G	A	T	A	T	G	
UAM:	C	T	A	G	A	G	A	G	A	T	A	G	A	G	T	A	T	G	A	G	T	G	A	A	T	A	T	A	T	T	T	G	A	G	A	G	A	A	C	A	G	T	G	G	A	T	A	T	G	
HUM:	T	C	A	G	G	C	A	G	T	T	T	C	T	C	A	C	C	A	G	G	A	T	C	T	C	T	A	C	G	A	G	T	T	T	A	C	G	-	-	G	G	T	G	T	C	C	A	G	T	G
UAM:	T	C	A	G	G	C	A	G	T	T	T	C	T	C	A	C	C	A	G	G	A	T	C	T	C	T	A	C	G	A	G	T	T	T	-	-	G	C	A	G	G	T	G	T	C	C	A	G	T	G
HUM:	T	G	A	G	G	T	A	C	A	G	C	T	G	G	T	G	G	A	G	T	C	T	G	G	A	G	A	G	G	A	C	C	C	A	A	G	A	C	A	A	C	C	T	-	-	-	G	G	G	G
UAM:	T	G	A	G	G	T	A	C	A	G	C	T	G	G	T	G	-	-	G	T	C	T	G	G	A	G	A	G	G	A	T	C	C	A	A	G	A	C	A	A	C	C	T	A	G	A	-	G	G	G
HUM:	T	T	C	C	C	T	G	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	G	A	T	T	A	A	C	C	T	T	C	A	G	T	A	G	C	T	A	C	T
UAM:	T	-	C	C	C	T	C	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	G	A	T	T	A	A	C	C	T	T	C	A	G	T	A	G	C	T	A	T	T
HUM:	G	A	A	T	G	A	G	C	T	C	G	G	T	T	T	C	C	C	A	G	G	C	T	C	C	A	G	G	G	A	A	G	G	G	G	C	T	G	G	A	G	T	G	A	G	T	A	G	T	A
UAM:	G	A	A	T	G	A	G	C	T	C	G	G	T	T	T	C	C	C	A	G	G	T	T	T	G	A	G	G	G	A	A	G	G	G	G	C	T	G	G	A	T	T	G	A	G	T	A	G	T	A
HUM:	G	A	T	A	T	A	C	A	G	T	G	T	G	A	T	G	G	A	A	G	T	C	A	G	A	T	A	T	G	T	T	A	T	G	C	A	C	A	A	T	C	T	G	T	G	A	C	G	A	G
UAM:	G	A	T	A	T	A	T	A	G	T	A	T	G	A	T	G	G	A	A	G	T	C	A	A	A	T	A	T	G	T	T	A	T	G	C	A	C	A	A	T	C	T	G	T	G	A	C	G	A	G
HUM:	C	A	G	A	T	T	C	A	C	C	G	T	C	T	C	C	A	A	A	G	A	A	A	A	T	G	C	C	A	A	G	A	A	C	T	C	A	C	T	G	T	A	T	T	T	G	C	A	A	A
UAM:	C	A	G	A	T	T	C	A	C	C	G	T	C	T	C	C	A	A	A	G	A	A	A	G	T	G	C	C	A	A	-	A	A	C	T	C	A	C	T	G	T	A	T	T	T	G	C	A	G	A
HUM:	T	G	A	A	C	A	G	T	C	T	G	A	G	A	G	C	A	G	A	G	G	G	C	A	C	A	G	C	T	G	T	G	T	G	T	T	A	C	T	G	T	A	T	G	T	G	A	G	G	C
UAM:	T	G	A	A	C	A	G	T	C	T	G	A	G	A	G	C	A	G	A	G	G	G	C	A	C	G	G	C	C	A	T	G	T	A	T	T	A	C	T	G	T	A	T	A	T	G	A	G	G	C
HUM:	A	C	C	A	G	G	T	A																																										
UAM:	A	C	C	A	G	G	T	A																																										
D7																																																		
HUM:	A	G	A	A	G	A	C																																											
UAM:	A	G	A	A	G	A	T																																											
D9																																																		
HUM:	A	G	G	T	T	C	C	T	G	T	A																																							
UAM:	A	A	T	T	T	C	C	T	G	C	A																																							

IGHVII-78-1

GENE ALIGN SEQ

HUM: T G G C C T G G T G A A G C C C T C A C A G A C C C T C T C C C T T A C C T G C G C T G T G T C T G
UAM: T G G C C T G G T G A A G C C C T C A C A G A C C C T C T C C C T C A C C T G T G C T G T G T C T G

HUM: T G T T C C C C G T G A T A A C G A G G T C T T C C T G C T G A A G C T G G A T C C A T C A G C C C
UAM: T G T T C C C C - - - A T A A T G A G G T C T T C C T G C T G A A G C T G G A T A C A T C A G C C C

HUM: C C C - - - A G G G A A G G G A A T G G A G T G G A T T G G G T G C A T A G G T C A T G A A G G G A
UAM: C C C T C T - G G G - A G G G A A T G G A G T G G A T C G G G T G C A T A G G T C A T G A A G G G A

HUM: G C A C A C A T T A C C A C C C A C T C C T C A A G T G T C C A G T C A C C A T C C C C A G A T C C
UAM: G C A C A C G T T A C C A C C C G C T T C T C A A G A G T C C A G T C A C C A T C C C C A G A T C C

HUM: G T G T C C A A A A A A G C A G T T C T T C C T A C A G C T G A G C T A C A T G A G C A A C A A G C
UAM: A T G T C C A A A A A A A C A G T T C T T C C T A C A G C T G A G C T G C G T G A G C A A C A A G C

HUM: A C A T A G C C A T G T A T T T T T A A G C C A A A G A
UAM: A C A T A G C C A T G T A T T T T T A A G C C T A A G A

D7

HUM: C A C A G T G
UAM: C A C A G T G

D9

HUM: C A C C C A A A C C T
UAM: C A C C C A A A C C T

IGHV5-78

GENE ALIGN SEQ

HUM:	A	T	G	G	G	G	T	C	A	A	C	C	G	T	C	A	T	C	C	T	T	T	C	C	C	T	C	G	T	C	C	T	G	G	C	T	G	T	T	C	T	C	C	A	A	G	G	T	C	A
UAM:	A	T	G	G	G	G	T	C	A	A	C	C	G	T	C	A	T	C	C	T	T	T	C	C	C	T	C	G	T	C	C	T	G	G	C	T	G	T	T	C	T	C	C	A	A	G	G	T	C	A
HUM:	G	T	C	C	T	G	C	C	C	A	G	G	G	T	T	T	G	A	G	G	T	C	A	C	A	G	A	G	A	A	G	A	A	T	G	G	G	C	A	G	A	A	G	G	G	A	G	C	C	C
UAM:	G	T	C	C	T	G	C	C	C	A	G	G	G	T	T	T	G	A	G	G	T	C	A	C	A	G	A	G	A	A	A	A	T	G	G	G	C	A	G	A	A	G	G	G	A	G	C	C	C	
HUM:	C	T	G	A	T	G	C	A	A	A	T	T	T	T	G	T	G	T	C	T	C	C	C	A	C	A	C	A	G	G	T	G	T	C	T	T	T	G	C	C	G	A	G	G	T	G	C	A	G	C
UAM:	C	T	G	A	T	G	C	A	A	A	T	T	T	T	G	T	G	T	C	T	G	C	C	G	C	A	C	A	G	G	T	G	T	C	T	T	T	G	C	C	G	A	G	G	T	G	C	A	G	C
HUM:	T	G	T	T	G	C	A	G	T	C	T	G	C	A	G	C	A	G	A	G	G	T	G	A	A	A	A	G	A	C	C	C	G	G	G	G	A	G	T	C	T	C	T	G	A	G	G	A	T	C
UAM:	T	G	G	T	G	C	A	G	T	C	T	G	C	A	G	C	A	G	A	G	G	T	G	A	A	A	A	G	G	C	C	C	G	G	G	G	A	G	T	C	T	C	T	G	A	G	G	A	T	C
HUM:	T	C	C	T	G	T	A	A	G	A	C	T	T	C	T	G	G	A	T	A	C	A	G	C	T	T	T	A	C	C	A	G	C	T	A	C	T	G	G	A	T	C	C	A	C	T	G	G	G	T
UAM:	T	C	C	T	G	T	A	A	G	A	C	T	T	C	T	G	G	A	T	A	C	A	G	C	T	T	T	A	C	C	A	G	C	T	A	C	T	G	G	A	T	C	C	A	C	T	G	G	G	T
HUM:	G	C	G	C	C	A	G	A	T	G	C	C	C	G	G	G	A	A	A	G	A	A	C	T	G	G	A	G	T	G	G	A	T	-	G	G	G	G	A	G	C	A	T	C	T	A	T	C	C	T
UAM:	G	T	G	C	C	A	G	G	T	G	C	C	C	G	A	G	A	A	A	G	A	A	C	T	G	G	A	G	T	G	G	A	T	A	G	G	G	G	-	G	C	A	T	C	T	A	T	C	C	T
HUM:	G	G	G	A	A	C	T	C	T	G	A	T	A	C	C	A	G	A	T	A	C	A	G	C	C	C	A	T	C	C	T	T	C	C	A	A	G	G	C	C	A	C	G	T	C	A	C	C	A	T
UAM:	G	G	G	A	A	C	T	C	T	G	A	T	A	C	C	A	G	A	T	A	C	A	G	C	C	C	A	T	C	C	T	T	C	C	A	A	G	C	C	C	A	T	G	T	C	A	C	C	A	T
HUM:	C	T	C	A	G	C	C	G	A	C	A	G	C	T	C	C	A	G	C	A	G	C	A	C	C	G	C	C	T	A	C	C	T	G	C	A	G	T	G	G	A	G	C	A	G	C	C	T	G	A
UAM:	C	T	C	A	G	C	C	G	A	C	A	G	C	T	C	T	A	T	C	A	G	C	A	C	C	A	C	C	T	A	C	C	T	G	C	A	G	T	G	G	A	G	C	A	G	C	C	T	G	A
HUM:	A	G	G	C	C	T	C	G	G	A	C	-	G	C	C	-	G	C	C	A	T	G	T	A	T	T	A	T	T	G	T	G	T	G	A	G	A	G												
UAM:	A	G	G	C	C	T	C	G	G	A	C	A	-	-	C	T	G	C	C	A	T	G	T	A	T	T	A	T	T	G	T	G	T	G	A	G	A	C												

D7

HUM:	G	G	A	C	C	A	T
UAM:	A	G	A	C	C	A	T

D9

HUM:	T	G	C	A	G	A	G	T	G	A	G
UAM:	T	G	C	A	G	A	G	T	G	A	G

IGHVIII-76-1

GENE ALIGN SEQ

HUM:	G	A	G	T	C	C	T	A	C	A	A	G	A	A	G	T	T	C	A	C	T	G	G	T	G	G	A	A	T	C	T	G	G	A	A	G	A	G	A	A	A	T	G	A	T	A	C	A	G	C
UAM:	G	A	G	T	C	C	T	A	C	A	A	G	A	A	G	T	T	C	A	C	T	G	G	T	G	G	A	A	T	C	T	G	G	A	A	G	A	G	A	A	A	T	G	G	T	A	C	A	G	C

HUM:	C	T	A	A	C	T	G	T	T	C	T	C	A	G	A	G	C	C	T	T	T	T	T	A	C	A	A	A	G	C	C	T	C	T	G	A	A	T	T	T	A	C	C	T	T	C	A	T	T
UAM:	C	C	A	A	C	A	A	T	T	C	T	C	A	G	A	G	C	C	T	T	T	T	T	A	C	A	A	A	G	C	C	T	C	T	G	A	A	T	T	T	A	C	C	T	T	C	A	T	T

HUM:	G	A	C	T	C	T	A	G	C	A	T	G	A	G	C	T	C	A	G	C	C	C	A	G	C	A	G	G	C	T	T	C	A	G	G	A	C	A	G	G	G	T	T	G	G	T	G	T	G	T	G
UAM:	G	A	C	T	C	T	A	G	C	A	T	G	A	G	C	T	C	A	G	C	C	C	A	G	C	A	G	G	C	T	T	C	A	G	G	A	C	A	G	G	G	T	T	G	T	G	T	G	T	G	

HUM:	G	G	A	G	G	C	A	A	A	A	G	C	G	A	G	G	G	A	T	T	C	A	A	G	T	G	G	A	A	T	T	T	G	T	T	A	G	T	G	G	T	A	C	C	C	T	C	C	A	T	
UAM:	G	G	A	G	G	C	A	A	A	C	A	G	C	A	A	G	T	G	A	T	T	C	A	A	G	T	G	G	A	A	T	T	T	G	T	T	A	G	T	G	G	T	A	C	C	C	T	C	C	A	T

HUM:	C	A	A	T	A	C	A	A	A	G	A	A	A	A	A	T	C	A	T	A	A	T	C	C	T	C	A	G	G	G	A	C	A	C	C	C	T	T	G	T	C	A	G	C	A	C	A	G	T	C
UAM:	C	A	A	T	A	C	A	A	A	G	A	A	A	A	A	T	C	A	T	A	A	T	C	T	T	C	A	G	G	G	A	C	A	C	C	C	T	T	G	T	C	A	G	C	A	C	A	G	T	C

HUM:	T	C	C	C	T	C	A	A	A	A	T	G	A	C	C	A	A	C	C	T	G	A	G	A	G	C	C	G	A	G	G	A	G	A	A	G	G	C	C	A	T	G	T	A	T	T	A	C	T	G
UAM:	T	C	C	C	T	C	A	A	A	A	T	G	A	C	C	A	A	C	C	T	G	A	G	A	G	C	C	G	A	G	C	A	G	A	A	G	G	C	C	A	T	G	T	A	T	T	A	C	-	-

HUM:	T	G	A	G	A	G	A
UAM:	T	G	A	G	A	G	A

HUM:	C	A	C	A	G	G	A
UAM:	C	A	C	A	G	G	A

HUM:	A	C	A	G	G	G	G	A	C	A	C
UAM:	A	C	A	G	G	A	G	A	C	A	C

IGHV3-76

GENE ALIGN SEQ

HUM:	A	T	G	G	A	G	T	T	A	G	G	A	A	T	G	C	G	C	T	G	G	G	T	T	T	T	C	T	T	T	G	T	T	G	T	T	G	T	T	C	T	A	A	A	A	G	G	C	A	A			
UAM:	A	T	G	G	A	G	T	T	A	G	G	A	A	T	G	C	G	C	T	G	G	G	T	T	T	T	C	T	T	T	G	T	T	G	T	T	G	T	T	-	-	-	C	T	A	A	A	A	G	G	C	G	A
HUM:	T	C	A	A	G	A	A	G	A	A	C	T	A	G	A	A	A	T	A	T	T	G	T	C	T	G	T	G	A	G	T	G	A	T	A	T	G	A	G	T	G	A	G	A	G	A	A	A	C	A			
UAM:	T	C	A	A	G	A	A	G	A	A	C	T	A	G	A	A	A	T	A	T	T	G	A	G	T	G	T	G	A	G	T	G	A	T	A	C	G	A	G	T	G	A	G	A	G	A	A	A	C	A			
HUM:	G	T	G	G	A	T	C	T	G	T	G	T	G	G	C	A	G	T	T	T	C	T	G	A	C	A	A	G	A	A	T	G	T	C	T	C	T	G	T	G	T	T	T	G	C	A	G	G	T	G			
UAM:	G	T	G	G	A	T	C	T	G	T	G	T	G	G	C	A	G	T	T	T	C	T	G	A	C	A	A	G	A	A	T	G	T	C	T	C	T	G	T	G	T	T	T	G	C	A	G	G	T	G			
HUM:	T	C	C	A	A	T	G	T	G	A	A	G	T	G	T	A	G	C	T	G	G	T	A	G	A	G	T	C	T	G	G	G	G	A	G	G	C	T	T	G	G	T	A	C	A	G	C	T	T				
UAM:	T	C	C	A	A	T	G	T	G	A	A	G	T	G	T	A	G	C	T	G	T	T	A	G	A	G	T	C	T	G	G	G	G	A	G	G	C	T	T	G	G	T	A	A	A	G	C	C	T				
HUM:	G	G	G	G	G	G	T	C	C	A	T	G	T	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	G	A	T	A	C	A	C	T	T	T	C	A	G	T	A	A			
UAM:	G	G	G	G	G	G	T	C	C	A	T	G	T	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	G	A	T	A	C	A	C	T	T	T	C	A	G	T	A	A			
HUM:	C	T	A	T	G	G	C	A	T	G	C	A	C	T	A	G	G	T	G	G	A	C	C	A	A	G	C	T	C	C	A	G	G	A	A	G	G	A	C	T	G	G	A	G	T	G	G	G					
UAM:	C	T	A	T	G	G	C	A	T	G	C	A	C	T	A	G	G	T	G	G	A	C	C	A	A	A	C	T	C	C	A	A	G	G	A	A	G	G	A	C	T	G	G	A	G	T	G	G	G				
HUM:	T	C	T	T	A	C	A	T	T	A	A	T	G	C	T	A	G	T	G	G	T	G	G	A	A	G	C	A	T	A	T	A	C	T	A	C	T	C	A	G	A	C	T	C	T	G	T	G	A	A			
UAM:	T	C	T	T	A	C	A	T	T	A	A	T	G	C	T	A	G	T	G	G	T	G	G	A	A	G	C	A	C	A	T	A	C	T	A	C	T	C	A	G	A	C	T	C	T	T	T	G	A	A			
HUM:	G	G	G	C	C	G	G	T	T	G	A	C	C	A	T	C	T	C	C	A	G	A	G	A	A	A	A	C	A	C	C	A	A	G	A	A	C	T	C	A	C	T	G	T	A	T	C	T	G	C			
UAM:	G	G	G	C	C	G	A	T	T	C	A	C	C	A	T	C	T	C	C	A	G	A	G	A	A	A	A	C	A	C	C	A	A	G	A	A	C	T	C	A	C	T	G	T	A	T	C	T	G	C			
HUM:	A	A	A	T	A	A	A	C	A	G	T	T	T	C	A	T	T	G	C	T	G	A	C	A	C	C	A	T	G	G	C	C	G	T	C	T	A	T	T	A	C	T	G	T	A	A	G	A	G	A			
UAM:	A	A	A	T	A	A	A	C	A	G	T	T	T	G	A	T	T	G	C	T	G	A	C	A	C	C	A	T	G	G	C	T	G	T	C	T	A	T	T	A	C	T	G	T	A	A	G	A	G	A			

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	G	T	C	A	C	A	A	A	C	C	T
UAM:	G	T	A	A	C	A	A	A	C	C	T

IGHV3-75

GENE ALIGN SEQ

HUM:	A	T	G	G	G	G	T	T	T	G	T	G	C	T	G	A	C	T	T	G	G	G	A	T	T	T	A	C	T	T	G	T	T	A	C	T	A	T	T	T	T	A	A	A	A	G	T	A	G	A	
UAM:	A	T	G	G	G	G	T	T	T	G	T	G	C	T	G	A	C	C	T	G	G	G	A	T	T	T	A	C	T	T	G	T	T	A	C	T	A	T	T	T	T	A	A	A	A	G	T	A	G	A	
HUM:	T	T	C	A	G	G	G	T	G	A	A	C	T	A	G	A	G	A	T	T	T	T	G	A	G	T	G	T	G	A	G	T	G	G	A	T	A	A	C	A	G	T	T	A	A	G	G	A	A	A	
UAM:	T	T	C	A	G	G	G	T	G	A	A	C	T	A	G	A	G	A	T	G	T	T	T	G	A	G	T	G	T	G	A	G	T	G	G	A	T	A	G	C	A	G	T	T	A	A	G	G	A	A	A
HUM:	C	A	C	T	G	A	A	A	A	T	A	T	G	T	G	C	C	A	G	T	T	T	C	T	G	A	C	C	A	G	G	A	T	G	C	C	C	C	T	G	T	G	T	T	T	T	T	G	G	G	
UAM:	C	A	C	T	G	A	A	A	A	T	A	T	G	T	G	C	C	A	G	T	T	T	C	T	G	A	C	C	A	G	A	A	T	G	C	C	C	C	T	G	T	G	T	T	T	T	T	G	G	G	
HUM:	T	G	T	C	C	A	G	T	G	T	G	A	G	G	C	G	C	A	G	T	T	G	T	T	G	-	-	G	A	G	C	C	T	G	G	G	G	A	G	A	C	T	T	G	G	T	A	C	A		
UAM:	T	G	T	T	C	A	G	T	G	T	G	A	G	G	T	G	C	A	G	T	T	G	-	-	G	T	A	G	A	G	G	C	T	G	G	G	G	A	G	A	C	T	T	G	G	T	G	C	A		
HUM:	G	C	C	T	G	G	C	G	C	G	G	T	G	G	G	G	G	T	G	G	G	G	T	C	C	C	T	G	A	G	A	C	T	G	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T		
UAM:	G	C	C	T	G	G	C	G	G	G	G	T	G	G	G	G	G	T	G	G	G	G	T	C	C	C	T	G	A	G	A	C	T	G	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T		
HUM:	G	G	A	T	T	T	G	C	C	T	T	C	A	G	T	A	G	C	C	A	C	T	G	G	A	T	G	C	A	C	T	G	G	G	C	C	T	G	C	C	A	G	G	C	T	C	C	A	G	G	
UAM:	G	G	A	C	T	C	A	C	C	T	T	C	A	G	T	A	G	C	C	A	C	T	G	G	A	T	G	C	A	C	T	G	G	G	T	C	T	G	C	C	A	G	G	C	T	C	C	A	G	G	
HUM:	G	A	A	C	A	G	A	C	T	G	G	A	G	T	G	G	G	T	C	T	C	A	T	G	T	A	T	T	A	G	T	A	C	T	G	A	T	G	G	G	A	G	T	A	G	C	A	T	A	C	
UAM:	G	A	A	C	A	G	A	C	T	G	G	A	G	T	G	G	G	T	C	T	C	A	T	G	T	A	T	T	A	G	T	A	C	T	G	A	T	G	G	G	A	G	T	A	G	C	A	T	A	C	
HUM:	G	C	T	A	T	G	C	A	C	A	T	T	C	T	G	G	G	A	A	G	T	T	C	T	G	A	T	T	C	C	C	C	A	T	C	T	C	C	A	G	A	A	A	C	A	A	T	G	C	C	
UAM:	G	C	T	A	T	G	C	A	C	A	T	T	C	C	G	G	G	A	A	G	T	T	C	T	G	A	T	T	C	C	C	C	A	T	C	T	C	C	A	G	A	A	A	C	A	A	T	G	C	C	
HUM:	A	A	G	A	A	C	A	C	A	C	T	C	T	T	A	T	C	T	G	G	A	A	A	T	G	A	A	C	A	G	T	T	T	G	A	G	A	G	C	T	G	A	G	T	A	C	A	C	A	G	
UAM:	A	A	G	A	A	C	A	T	A	C	T	C	-	T	A	T	C	T	G	G	A	A	A	T	G	A	A	C	A	G	T	T	T	G	A	G	A	G	C	T	G	A	G	T	A	C	A	C	A	G	
HUM:	C	C	A	C	G	T	A	T	T	A	C	T	G	T	G	C	T	G	G	A	G	A																													
UAM:	C	C	A	T	G	T	A	T	T	A	C	T	G	T	G	C	C	G	G	A	G	A																													

D7

HUM:	C	G	C	A	G	T	G
UAM:	T	G	C	A	G	T	G

D9

HUM:	G	A	C	A	C	A	A	A	C	C	T
UAM:	G	A	C	A	C	A	A	A	C	C	T

IGHVII-74-1

GENE ALIGN SEQ

HUM:	G	T	G	C	C	C	T	G	T	C	T	T	T	G	G	A	G	C	A	G	C	T	A	C	A	G	G	A	G	T	C	A	G	G	C	C	C	A	G	A	C	T	A	G	A	A	G	A	G	C
UAM:	G	T	G	C	C	C	T	G	T	C	T	T	T	G	G	A	G	C	A	G	C	T	A	C	A	G	A	A	G	T	C	A	G	G	C	C	C	A	G	A	C	T	A	G	A	A	G	A	G	C

HUM:	C	C	A	C	A	C	T	G	A	C	C	T	T	C	T	G	C	A	T	C	A	C	T	T	A	T	G	C	T	C	T	C	T	C	T	G	G	C	C	A	C	T	A	C	A	T	C	A	C	A
UAM:	C	C	A	C	A	C	T	G	A	C	C	T	T	C	T	G	C	A	T	C	A	C	T	T	A	T	G	C	T	G	T	C	T	C	T	G	G	C	C	A	C	T	A	C	A	T	C	A	C	A

HUM:	A	A	C	A	G	T	G	C	T	T	A	T	G	A	C	T	G	G	G	C	C	T	G	A	A	T	C	T	G	C	C	A	G	C	C	C	A	G	G	A	A	A	G	G	G	C	T	G	G	A
UAM:	A	A	C	A	G	T	G	C	T	T	A	T	G	A	C	T	G	G	G	C	C	T	G	A	A	T	T	T	G	C	C	A	G	C	C	C	A	G	G	A	A	A	G	G	G	C	T	G	G	A

HUM:	A	T	G	G	A	T	G	G	G	G	T	G	C	A	T	T	G	G	T
UAM:	A	T	G	G	A	T	G	G	G	G	T	G	C	A	T	T	G	G	T

D7

HUM:	A	G	T	G	A	T	G
UAM:	A	G	T	G	A	T	G

D9

HUM:	G	C	A	A	A	T	G	G	A	A	G
UAM:	G	C	A	A	A	T	G	G	A	A	G

IGHV3-74

GENE ALIGN SEQ

HUM:	A	T	G	G	A	G	T	T	T	G	G	G	C	T	G	A	G	C	T	G	G	G	T	T	T	T	C	C	T	T	G	T	T	G	C	T	A	T	T	T	T	A	A	A	A	G	G	T	G	A		
UAM:	A	T	G	G	A	G	T	T	T	G	G	G	T	T	G	A	G	C	T	G	G	G	T	T	T	T	C	C	T	T	G	C	T	G	C	T	A	T	T	T	T	A	A	A	A	G	G	T	G	A		
HUM:	T	T	C	A	T	G	G	A	G	A	A	C	T	G	G	A	G	A	T	A	T	G	G	A	G	T	G	T	G	A	A	T	G	G	A	C	A	T	G	A	G	T	G	A	G	A	T	A	A	G		
UAM:	T	T	C	A	T	G	G	A	A	A	A	C	T	A	G	A	G	A	T	A	T	T	G	A	G	T	G	T	G	A	A	A	G	G	A	C	A	T	G	A	G	T	G	A	G	A	-	-	-	G		
HUM:	-	-	-	C	A	G	T	G	G	A	T	G	T	G	T	G	T	G	G	C	A	G	T	T	T	C	T	G	A	C	C	A	G	G	G	T	G	T	C	T	C	T	G	T	G	T	T	T	G	C		
UAM:	A	A	A	C	A	G	T	G	G	A	T	T	T	G	T	G	T	G	G	C	A	G	T	T	T	C	T	G	A	C	C	A	G	G	G	T	G	T	C	T	T	T	T	G	T	T	T	G	C			
HUM:	A	G	G	T	G	T	C	C	A	G	T	G	T	G	A	G	G	T	G	C	A	G	C	T	G	G	T	G	G	A	G	T	C	C	G	G	G	G	A	G	G	C	T	T	A	G	T	T	C			
UAM:	A	G	G	T	G	T	C	C	A	G	T	G	T	G	A	G	G	T	G	C	A	G	C	T	G	T	G	G	A	G	T	C	A	G	G	G	G	A	G	G	C	T	T	G	G	T	A	C				
HUM:	A	G	C	C	T	G	G	G	G	G	T	C	C	C	T	G	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	G	A	T	T	C	A	C	C	T	T	C			
UAM:	A	G	C	C	T	G	A	G	G	G	T	C	C	C	T	G	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	G	A	T	T	C	A	C	C	T	T	C			
HUM:	A	G	T	A	G	C	T	A	C	T	-	-	-	-	G	G	A	T	G	C	A	C	T	G	G	G	T	C	C	G	C	C	A	A	G	C	T	C	-	C	A	G	G	-	G	A	A	G	G	G		
UAM:	A	G	T	A	A	C	T	A	C	T	A	C	A	T	-	G	A	-	-	-	A	C	T	G	G	G	T	C	T	G	C	C	A	G	G	C	T	C	T	-	-	G	G	A	G	A	A	G	G	G		
HUM:	G	C	T	G	G	T	G	T	G	G	G	T	C	T	C	A	C	G	T	A	T	T	A	A	T	A	G	T	G	A	T	G	G	G	A	G	T	A	G	C	A	C	A	A	G	C	T	A	C	G		
UAM:	G	T	T	G	G	A	G	T	G	G	T	T	C	T	C	A	C	C	T	A	T	T	A	A	T	A	G	A	G	A	T	G	G	G	A	G	T	A	G	C	A	T	A	A	G	C	T	A	T	G		
HUM:	C	G	G	A	C	T	C	C	G	T	G	A	A	G	G	G	C	C	G	A	T	T	C	A	C	C	A	T	C	T	C	C	A	G	A	G	A	C	A	A	C	G	C	C	A	A	G	A	A	C		
UAM:	C	A	G	A	C	T	C	C	A	T	G	A	A	G	G	G	C	C	A	A	T	T	T	A	C	C	A	T	C	T	C	C	A	G	A	G	A	C	A	A	C	G	C	C	A	A	G	A	A	C		
HUM:	A	C	G	C	T	G	T	A	T	C	T	G	C	A	A	A	T	G	A	A	C	A	G	T	C	T	G	A	G	A	G	C	C	G	A	G	G	A	C	A	C	G	G	C	T	G	T	G	T	A		
UAM:	A	C	G	C	T	A	T	A	T	C	T	G	C	G	A	A	T	G	A	A	C	A	G	T	C	T	G	A	G	A	G	C	C	G	A	G	A	A	C	A	C	A	C	G	A	C	T	G	T	G	T	A
HUM:	T	T	A	C	T	G	T	G	C	A	-	-	A	G	A	G	A																																			
UAM:	T	T	A	C	T	G	T	-	-	A	C	T	A	G	A	G	A																																			

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	G	C	A	G	T	G

D9

HUM:	G	A	C	A	C	A	A	A	C	C	T
UAM:	G	A	C	A	C	A	A	A	C	C	T

IGHV3-73

GENE ALIGN SEQ

HUM:	A	T	G	G	A	G	T	T	T	G	G	G	C	T	G	A	G	C	T	G	G	G	T	T	T	C	C	T	T	G	T	T	G	C	T	A	T	T	T	A	A	A	A	G	G	T	G	A		
UAM:	A	T	G	G	A	G	T	T	T	G	T	A	C	T	G	A	G	C	T	G	G	G	T	T	T	C	C	T	T	G	T	T	G	C	T	A	T	T	T	A	A	A	A	G	G	T	G	A		
HUM:	T	T	C	A	T	G	G	G	G	A	A	C	T	A	G	A	G	A	T	A	C	T	G	A	G	T	G	T	G	A	G	T	G	G	A	C	A	T	G	A	G	T	G	A	G	A	A	A		
UAM:	T	T	C	A	T	G	G	A	G	A	A	C	T	A	G	A	G	A	T	G	T	T	G	A	G	T	G	T	G	A	G	G	G	A	C	A	T	G	A	G	T	G	A	G	A	G	A	A	A	
HUM:	C	A	G	T	G	G	A	C	G	T	G	T	G	T	G	G	C	A	C	T	T	T	C	T	G	A	C	C	A	G	G	G	T	G	T	C	T	C	T	G	T	G	T	T	T	G	C	A	G	G
UAM:	C	A	G	T	G	G	A	T	G	T	G	T	G	T	G	G	C	A	G	T	T	T	C	T	G	A	C	C	A	G	G	G	T	G	T	C	T	C	T	G	T	G	T	T	T	G	C	A	G	G
HUM:	T	G	T	C	C	A	G	T	G	T	G	A	G	G	T	G	C	A	G	C	T	G	G	T	G	G	A	G	T	C	C	G	G	G	G	A	G	G	C	T	T	G	G	T	C	C	A	G	C	
UAM:	T	G	T	C	C	A	G	T	G	T	G	A	G	G	T	G	C	A	G	C	T	G	G	T	G	G	A	G	T	C	T	G	G	G	G	A	G	G	C	T	T	A	G	T	C	C	A	G	C	
HUM:	C	T	G	G	G	G	G	T	C	C	C	T	G	A	A	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	G	G	T	T	C	A	C	C	T	T	C	A	G	T	
UAM:	C	T	G	G	C	G	G	G	T	C	C	C	T	G	A	G	A	C	T	C	T	C	C	T	G	T	G	C	T	G	C	C	T	C	T	G	G	A	T	T	C	A	C	C	T	C	A	G	T	
HUM:	G	-	G	C	T	C	T	G	C	T	A	-	-	-	-	-	T	G	C	A	C	T	G	G	G	T	C	C	G	C	C	A	G	G	C	T	T	C	C	G	G	G	A	A	A	G	G	G	C	T
UAM:	G	A	-	-	-	-	-	-	C	T	A	C	C	A	G	A	T	G	T	A	C	T	G	G	G	T	G	C	G	C	C	A	G	G	C	T	T	C	T	G	G	G	A	A	A	G	G	A	C	C
HUM:	G	G	A	G	T	G	G	G	T	T	G	G	C	C	G	T	A	T	T	A	G	A	A	G	C	A	A	A	G	C	T	A	A	C	A	G	T	T	A	C	G	C	G	A	C	A	G	C	A	T
UAM:	G	G	A	G	T	G	G	G	T	T	G	G	C	T	A	T	A	T	T	G	G	A	A	G	C	A	A	A	T	C	T	A	A	C	A	G	T	T	A	T	G	C	G	A	C	A	G	C	A	T
HUM:	A	T	G	C	T	G	C	G	T	C	G	G	T	G	A	A	A	G	G	C	A	G	G	T	T	C	A	C	C	A	T	C	T	C	C	A	G	A	G	A	T	G	A	T	T	C	A	A	A	G
UAM:	A	C	G	C	T	G	C	G	T	C	T	G	T	G	A	A	A	G	G	C	A	G	G	T	T	C	A	C	C	A	T	C	T	C	A	A	G	A	G	A	T	G	A	T	T	C	A	A	A	G
HUM:	A	A	C	A	C	G	G	C	G	T	A	T	C	T	G	C	A	A	A	T	G	A	A	C	A	G	C	C	T	G	A	A	A	A	C	C	G	A	G	G	A	C	A	C	G	G	C	C	G	T
UAM:	A	A	C	A	C	A	C	C	G	T	A	T	C	T	G	C	A	A	A	T	G	A	A	C	A	G	C	C	T	G	A	A	A	A	C	C	G	A	G	G	A	C	A	C	G	G	C	C	C	T
HUM:	G	T	A	T	T	A	C	T	G	T	A	C	T	A	G	A	C	A																																
UAM:	G	T	A	T	T	A	C	T	G	T	G	C	T	A	G	A	T	A																																

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	G	A	C	A	C	A	A	A	C	C	T
UAM:	G	A	T	A	C	A	A	A	C	C	T

IGHV3-72

GENE ALIGN SEQ

HUM:	A	T	G	G	A	G	T	T	T	G	G	G	C	T	G	A	G	C	T	G	G	G	T	T	T	T	C	C	T	T	G	T	T	G	T	T	A	T	T	T	A	C	A	A	G	G	T	G	A	
UAM:	A	T	G	G	A	G	T	T	T	G	G	G	C	T	G	A	T	C	T	G	G	G	T	T	T	T	C	C	T	T	G	T	T	G	C	T	A	T	T	T	T	A	A	A	A	G	G	T	G	A
HUM:	T	T	T	A	T	G	G	A	G	A	A	C	T	A	G	A	G	A	T	G	T	T	A	A	G	T	G	T	G	A	G	T	G	G	A	C	G	T	G	A	G	T	G	A	G	A	A	A		
UAM:	T	T	C	A	T	G	G	A	G	A	A	C	T	A	G	A	G	A	T	G	T	T	G	A	G	T	G	T	G	A	G	T	G	G	A	C	A	T	G	A	A	T	G	A	G	A	G	A	A	A
HUM:	C	A	G	T	G	G	A	T	T	T	G	T	G	T	G	A	C	A	G	T	T	T	C	T	G	A	C	C	A	G	G	G	T	G	T	C	T	C	T	G	T	G	T	T	T	G	C	A	G	G
UAM:	C	A	G	T	G	G	A	T	T	T	G	T	G	T	G	G	C	A	G	T	T	T	C	T	G	A	C	C	A	G	G	G	T	G	T	C	T	C	T	G	T	G	T	T	T	G	C	A	G	G
HUM:	T	G	T	C	C	A	G	T	G	T	G	A	G	G	T	G	C	A	G	C	T	G	G	T	G	G	A	G	T	C	T	G	G	G	G	A	G	G	C	T	T	G	G	T	C	C	A	G	C	
UAM:	T	C	T	C	C	A	G	T	G	T	G	A	G	G	T	G	C	A	G	C	T	G	G	T	G	G	A	G	T	C	T	G	G	G	G	T	A	G	G	C	T	T	G	G	T	C	C	A	G	C
HUM:	C	T	G	G	A	G	G	G	T	C	C	C	T	G	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	G	A	T	T	C	A	C	C	T	T	C	A	G	T
UAM:	C	T	G	G	G	G	G	G	T	C	C	C	T	G	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	G	A	T	T	C	A	C	C	T	T	C	A	G	T
HUM:	G	A	C	C	A	C	T	A	C	A	T	G	G	A	C	T	G	G	G	T	C	C	G	C	C	A	G	G	C	T	C	C	A	G	G	A	A	G	G	G	G	C	T	G	G	A	G	T	G	
UAM:	G	A	C	C	A	C	T	A	C	A	T	G	G	A	C	T	G	G	G	T	C	C	G	C	C	A	G	G	C	T	C	C	A	G	G	A	A	G	G	G	G	C	T	G	G	A	G	T	G	
HUM:	G	G	T	T	G	G	C	C	G	T	A	C	T	A	G	A	A	A	C	A	A	A	G	C	T	A	A	C	A	G	T	T	A	C	A	C	C	A	C	A	G	A	A	T	A	C	G	C	C	G
UAM:	G	G	T	T	G	C	C	C	G	T	A	T	T	A	G	A	A	A	C	A	A	A	G	C	T	A	A	C	A	G	T	T	A	C	A	C	C	A	C	A	G	A	A	T	A	C	G	C	C	G
HUM:	C	G	T	C	T	G	T	G	A	A	A	G	G	C	A	G	A	T	T	C	A	C	C	A	T	C	T	C	A	A	G	A	G	A	T	G	A	T	T	C	A	A	A	G	A	A	C	T	C	A
UAM:	C	G	T	C	T	G	T	G	A	A	A	G	G	A	A	G	A	T	T	T	A	C	C	A	T	C	T	C	A	A	G	A	G	A	T	G	A	T	T	C	A	A	A	G	A	A	C	A	C	A
HUM:	C	T	G	T	A	T	C	T	G	C	A	A	A	T	G	A	A	C	A	G	C	C	T	G	A	A	A	A	C	C	G	A	G	G	A	C	A	C	G	G	C	C	G	T	G	T	A	T	T	A
UAM:	C	T	G	T	A	T	C	T	G	C	A	A	A	T	G	A	G	C	A	G	C	C	T	G	A	A	A	A	C	C	G	A	G	G	A	C	A	C	G	G	C	C	G	T	G	T	A	T	T	A
HUM:	C	T	G	T	G	C	T	A	G	A	G	A																																						
UAM:	C	T	G	T	G	C	T	A	G	A	G	A																																						

D7

HUM:	C	A	C	A	G	C	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	G	A	C	A	C	A	A	A	C	C	T
UAM:	G	A	C	A	C	A	A	A	C	C	T

IGHV2-70

GENE ALIGN SEQ

HUM:	A	T	G	G	A	C	A	T	A	C	T	T	T	G	T	T	C	C	A	C	G	C	T	C	C	T	G	C	T	A	C	T	G	A	C	T	G	T	C	C	C	G	T	C	C	T	G	T	G	A
UAM:	A	T	G	G	A	C	A	T	G	C	T	T	T	G	T	T	T	C	A	C	G	C	T	C	C	T	G	C	T	A	C	T	G	A	C	C	G	T	C	C	C	G	T	C	C	T	G	T	G	A
HUM:	G	T	G	C	T	G	T	G	G	T	C	A	G	G	T	A	G	-	-	T	A	C	T	T	C	A	G	A	A	G	C	A	A	A	A	A	T	C	T	A	T	T	C	T	C	T	C	C	T	
UAM:	G	T	G	C	T	G	T	G	G	T	C	A	G	G	-	-	G	A	C	T	A	C	T	T	C	A	G	A	A	G	C	G	A	A	A	C	A	T	C	T	G	T	T	C	T	C	T	C	C	T
HUM:	T	T	G	T	G	G	G	C	T	T	C	A	T	C	T	T	C	T	T	A	T	G	T	C	T	T	C	T	C	C	A	C	A	G	G	G	G	T	C	T	T	A	T	C	C	C	A	G	G	T
UAM:	T	T	G	T	G	G	G	C	T	T	C	A	T	C	T	T	C	T	T	A	T	G	T	C	T	T	C	T	C	C	A	C	A	G	G	G	G	T	C	T	T	C	T	C	T	C	A	G	G	T
HUM:	C	A	C	C	T	T	G	A	G	G	G	A	G	T	C	T	G	G	T	C	C	T	G	C	G	C	T	G	G	T	G	A	A	A	C	C	C	A	C	A	C	A	G	A	C	C	C	T	C	A
UAM:	C	A	C	C	T	T	G	A	A	G	G	A	G	T	C	T	G	G	T	C	C	T	G	C	G	T	T	G	G	T	G	A	A	A	C	C	C	A	C	A	C	A	G	A	C	C	C	T	C	A
HUM:	C	A	C	T	G	A	C	C	T	G	C	A	C	C	T	T	C	T	C	T	G	G	G	T	T	C	T	C	A	C	T	C	A	G	C	A	C	T	A	G	T	G	G	A	A	T	G	T	-	-
UAM:	C	G	C	T	G	A	C	C	T	G	C	A	C	C	T	T	C	T	C	T	G	G	G	T	T	C	T	C	A	C	T	C	A	G	C	A	C	T	A	G	T	G	G	A	-	-	G	T	G	G
HUM:	G	T	G	T	G	A	G	C	T	G	G	A	T	C	C	G	T	C	A	G	C	C	C	C	C	A	G	G	G	A	A	G	G	C	C	C	T	G	G	A	G	T	G	G	C	T	T	G	C	A
UAM:	G	T	G	T	G	G	G	C	T	G	G	A	T	C	C	G	T	C	A	G	C	C	C	C	C	A	G	G	G	A	A	G	G	C	C	C	T	G	G	A	G	T	G	G	C	T	T	G	C	A
HUM:	C	T	C	A	T	T	G	A	T	T	G	G	G	A	T	G	A	T	G	A	T	A	A	A	T	A	C	T	A	C	A	G	C	A	C	A	T	C	T	C	T	G	A	A	G	A	C	C	A	G
UAM:	A	G	A	A	T	T	G	A	T	T	G	G	G	A	T	G	A	T	G	A	T	A	A	A	T	A	C	T	A	C	A	G	C	C	C	A	T	C	T	C	T	G	A	A	G	A	G	C	A	G
HUM:	G	C	T	C	A	C	C	A	T	C	T	C	C	A	A	G	G	A	C	A	C	C	T	C	C	A	A	A	A	A	C	C	A	G	G	T	G	G	T	C	C	T	T	A	C	A	A	T	G	A
UAM:	G	C	T	C	A	C	C	A	T	C	T	C	C	A	A	G	G	A	C	A	C	C	T	C	C	A	A	A	A	A	C	C	A	G	G	T	G	G	T	C	G	T	T	A	C	A	A	T	G	A
HUM:	C	C	A	A	C	A	T	G	G	A	C	C	C	T	G	T	G	G	A	C	A	C	A	G	C	C	A	C	G	T	A	T	T	A	C	T	G	T	G	C	A	C	G	G	A	T	A	C		
UAM:	C	C	A	A	C	A	T	G	G	A	C	C	C	T	G	T	G	G	A	C	A	C	A	G	C	C	A	C	A	T	A	T	T	A	C	T	G	T	G	C	A	C	G	G	A	T	A	C		

D7

HUM:	C	A	C	A	G	A	G
UAM:	C	A	C	A	G	A	G

D9

HUM:	T	A	C	A	A	G	A	A	C	C	C
UAM:	T	A	C	A	A	G	A	A	C	C	C

IGHV1-69D

GENE ALIGN SEQ

HUM:	A	T	G	G	A	C	T	G	G	A	C	C	T	G	G	A	G	G	T	T	C	C	T	C	T	T	T	G	T	G	G	T	G	G	C	A	G	C	A	G	C	T	A	C	A	G	G	T	A	A
UAM:	A	T	G	G	A	C	T	G	G	A	C	C	T	G	G	A	G	G	T	T	C	C	T	C	T	T	T	G	T	G	G	T	G	G	C	A	G	C	A	G	C	T	A	C	G	G	T	A	A	
HUM:	G	G	G	G	C	T	T	C	C	T	A	G	T	C	C	T	A	A	G	G	C	T	G	A	G	G	A	A	G	G	G	A	T	C	C	T	G	G	T	T	T	A	G	T	T	A	A	A	G	A
UAM:	G	G	G	G	C	T	T	C	C	T	A	G	T	C	C	T	A	A	A	G	C	T	G	A	G	G	A	A	G	G	G	A	T	C	C	T	G	G	T	T	T	A	G	T	T	A	A	A	G	A
HUM:	G	G	A	T	T	T	T	A	T	T	C	A	C	C	C	C	T	G	T	G	T	C	C	T	C	T	C	C	A	C	A	G	G	T	G	T	C	C	A	G	T	C	C	C	A	G	G	T	G	C
UAM:	G	G	A	T	T	T	T	A	T	T	C	A	C	T	C	C	T	G	T	G	T	C	C	T	C	T	C	C	A	C	A	G	G	T	G	T	C	C	A	G	T	C	C	C	A	G	G	T	C	C
HUM:	A	G	C	T	G	G	T	G	C	A	G	T	C	T	G	G	G	G	C	T	G	A	G	G	T	G	A	A	G	A	A	G	C	C	T	G	G	G	T	C	C	T	C	G	G	T	G	A	A	G
UAM:	A	G	C	T	G	G	T	G	C	A	G	T	C	G	G	G	G	G	C	T	G	A	G	G	T	G	A	A	G	A	A	G	C	C	T	G	G	G	T	C	C	T	C	A	G	T	G	A	A	G
HUM:	G	T	C	T	C	C	T	G	C	A	A	G	G	C	T	T	C	T	G	G	A	G	G	C	A	C	C	T	T	C	A	G	C	A	G	C	T	A	T	G	C	T	A	T	C	A	G	C	T	G
UAM:	A	T	C	T	C	C	T	G	C	A	A	G	G	T	T	T	C	T	G	A	A	G	A	C	A	C	C	T	T	C	A	G	C	A	G	C	T	A	T	G	C	T	A	T	C	A	G	C	T	G
HUM:	G	G	T	G	C	G	A	C	A	G	G	C	C	C	C	T	G	G	A	C	A	A	G	G	G	C	T	T	G	A	G	T	G	G	A	T	G	G	G	A	G	G	G	A	T	C	A	T	C	C
UAM:	G	G	T	G	C	G	A	C	A	G	G	C	C	C	C	T	G	G	A	C	A	A	G	G	G	C	T	T	G	A	G	T	G	G	A	T	G	G	G	A	G	G	G	A	T	C	A	T	C	C
HUM:	C	T	A	T	-	C	T	T	T	G	G	T	A	C	A	G	C	A	A	A	C	T	A	C	G	C	A	C	A	G	A	A	G	T	T	C	C	A	G	G	G	C	A	G	A	G	T	C	A	C
UAM:	C	T	G	T	G	C	-	T	T	G	G	T	A	C	A	G	C	A	G	A	C	T	A	T	G	C	A	C	A	G	A	A	G	T	T	C	C	A	G	G	G	C	A	G	A	G	T	C	A	C
HUM:	G	A	T	T	A	C	C	G	C	G	G	A	C	G	A	-	A	T	C	C	A	C	G	A	G	C	A	C	A	G	C	C	T	A	C	A	T	G	G	A	G	C	T	G	A	G	C	A	G	C
UAM:	G	A	T	T	A	C	C	G	C	G	G	A	C	-	A	C	A	T	C	A	A	C	G	A	G	C	A	C	A	G	C	C	T	A	C	A	T	G	G	A	G	C	T	G	A	G	C	A	G	C
HUM:	C	T	G	A	G	A	T	C	T	G	A	G	G	A	C	A	C	G	G	C	C	G	T	G	T	A	T	T	A	C	T	G	T	G	C	G	A	-	-	G	A	G	A							
UAM:	C	T	G	A	G	A	T	C	T	G	A	G	G	A	C	A	C	G	G	C	C	G	T	G	T	A	T	T	A	C	T	G	T	G	C	-	A	A	C	-	A	G	A							

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	G	T	C	A	G	A	A	A	C	C	C
UAM:	G	T	C	A	G	A	A	A	C	C	C

IGHV1-68

GENE ALIGN SEQ

HUM:	A	T	G	G	A	C	A	G	G	A	C	C	T	A	G	A	G	C	T	A	A	T	C	T	T	C	C	T	G	G	T	G	G	C	A	G	C	A	G	C	T	A	C	A	G	G	T	A	A	G		
UAM:	A	C	G	G	A	C	A	G	G	A	C	C	T	A	G	A	G	C	T	A	A	T	C	T	T	C	C	T	G	G	T	G	G	C	A	G	C	A	G	C	T	A	C	A	G	G	T	A	A	G		
HUM:	G	T	G	C	T	C	C	C	A	A	G	T	C	C	C	A	G	T	G	A	T	G	A	G	A	A	G	G	G	A	T	T	G	A	G	T	A	C	A	G	T	C	A	A	G	G	A	G	G			
UAM:	G	T	G	C	T	C	C	C	A	A	G	T	C	C	C	A	G	T	G	A	T	G	A	G	A	A	G	G	G	A	T	T	G	A	G	T	A	C	G	G	T	C	A	A	G	G	A	G	G			
HUM:	C	T	T	T	C	A	T	C	C	A	C	T	C	C	T	G	T	G	T	C	C	C	A	C	C	C	T	C	C	A	A	T	G	G	G	T	G	T	C	T	G	C	T	C	C	C	A	G	G	T		
UAM:	C	T	T	T	C	A	T	C	C	A	C	T	C	C	T	G	T	G	T	C	C	C	A	C	C	C	T	C	C	A	A	T	G	G	G	T	G	T	C	T	G	C	T	C	C	C	A	G	G	T		
HUM:	G	C	A	G	C	T	G	G	G	G	C	A	G	T	C	T	G	A	G	G	C	T	G	A	G	G	T	A	A	A	G	A	A	G	C	C	T	G	G	G	G	C	C	T	C	A	G	T	G	A		
UAM:	G	C	A	G	C	T	G	G	G	G	C	A	G	T	C	T	G	A	G	G	C	T	G	A	G	G	T	G	A	A	G	A	A	G	C	C	T	G	G	G	G	C	C	T	C	A	G	T	G	A		
HUM:	A	G	G	T	C	T	C	C	T	G	C	A	A	G	G	C	T	T	C	C	G	G	A	T	A	C	A	C	C	T	T	C	A	C	T	T	G	C	T	G	C	T	C	C	T	T	G	C	A	C		
UAM:	A	G	G	T	C	T	C	C	T	G	C	A	A	G	G	C	T	T	C	C	G	G	A	T	A	C	A	C	C	T	T	C	A	C	C	T	A	C	T	G	C	T	A	C	T	T	G	C	A	C		
HUM:	T	G	G	T	T	G	C	A	A	C	A	G	G	C	C	C	C	T	G	G	A	C	A	A	G	G	G	C	T	T	G	A	A	A	G	G	A	T	G	A	G	A	T	G	G	A	T	C	A	C		
UAM:	T	G	G	G	T	G	T	G	A	C	A	G	G	C	C	C	C	T	G	G	A	C	A	A	G	G	G	C	T	T	G	A	A	T	G	G	A	T	G	A	G	A	T	G	G	A	T	C	A	C		
HUM:	A	C	T	T	T	A	C	A	A	T	G	G	T	A	A	C	A	C	C	A	A	C	T	A	T	G	C	A	A	A	G	A	A	G	T	T	C	C	A	G	G	G	C	A	G	A	G	T	C	A		
UAM:	A	C	T	T	T	G	C	A	A	T	G	G	T	A	A	C	G	C	C	A	A	C	T	G	C	G	C	A	C	A	G	A	A	G	T	T	C	C	A	G	G	G	C	A	G	A	G	T	C	A		
HUM:	C	C	A	T	T	A	C	C	A	G	G	G	A	C	A	T	G	T	C	C	C	T	G	A	G	G	A	C	A	G	C	C	T	A	C	A	T	A	G	A	G	C	T	G	A	G	C	A	G	C		
UAM:	C	C	A	T	T	A	C	C	A	G	G	G	A	C	A	T	G	T	C	C	C	T	G	A	G	G	A	C	A	G	C	C	T	A	C	A	T	G	G	A	G	C	T	G	A	G	T	A	G	C		
HUM:	C	T	G	A	G	A	T	C	T	G	A	G	G	A	C	T	C	G	G	C	T	G	T	G	T	A	T	T	A	C	T	G	G	G	C	A	A	G	A	T	A	C	A	C	G	G	T	G	C	G		
UAM:	C	T	G	A	G	A	T	C	T	G	A	G	G	A	C	T	C	G	G	C	T	G	T	G	T	A	T	T	A	C	T	G	G	G	C	A	A	G	A	T	A	C	A	C	A	G	T	G	T	G		
HUM:	A	G	A	A	C	C	C	A	C	A	T	C	C	T	G	A	G	A	G	A	G	T	C	A	G	G	A	A	C	C																						
UAM:	A	G	A	A	C	C	C	A	C	A	T	C	C	T	G	A	G	A	G	T	G	T	C	A	G	A	A	A	C	C																						

D7

HUM:	C	C	A	G	G	G	A
UAM:	C	C	A	G	G	G	G

D9

HUM:	A	G	G	A	G	A	T	G	A	C	A
UAM:	G	G	A	G	A	T	G	A	C	A	A

IGHVIII-67-4

GENE ALIGN SEQ

HUM: A A G T C C T G T A T G A A G T T C A G T G G T G G A G T C A G A G G G G T A A A C G T A G T A C A
UAM: A A G T C C T G T A T G A A G T T C A G T G G T G G A G T C A G A G G G G T A A A C G T T G T A C A

HUM: G C C C A G T G G T T C A C T G A G A C T T T C T T G C A A A G C G T C T G G A T T C A C C T T T T
UAM: G C C C A G T G G T T C A C T G A G A C T T T C T T G C A A A G C G T C T G G A T T C A C C T T T G

HUM: C T G G C A A C A G C C T G A G G T T G G T C C A G C A G G C T T C A C A A C A G G G A T T G T G G
UAM: C T G G C A A C A G C C T G A G G T T G G T C C A G C A G G C T T C A C A A C A G G G A C T G T T G

HUM: T G G C T G G C A A C A G T G A G T C A A C A A G T G G G A G T G C T C A G G T T T A C T C T T C A
UAM: T G G C T G G C A A T A G T G A G T C A T C A A G T G G G A G T G C T C A G G G T T A C T C T T C A

HUM: T G A G T A C A A A T A A A T T A A C T G G T C C A G C G A C A C C C T T T C A C G T G C A C T C T
UAM: T G A G T A C A A A T A A A T T A A C T G G T C C A G T G A C A C C C T T T C A C G T G C A G T C T

HUM: A C C T T A C A A T G A C T A A C C T G A A A G C C A A G G A C A A G G T T G T G T A A T A C T G T
UAM: A C C T T A C A A T G A C T A A C C T G A A A G C C A A G G A C A A G G T T G T G T A A T A C T G T

HUM: G A G C T T
UAM: G G G G T T

D7

HUM: C A C A G G A
UAM: C A C A G G A

D9

HUM: A G A C A C A A A A A
UAM: A G A C A C A A A A A

IGHVIII-67-3

GENE ALIGN SEQ

HUM: C A G C C T G G C T G T T C T C T T A G C C T C T T T T G C A A A G C A T C A A G A T T C A C C T T
UAM: C A G C C T G G C T G T T C T C T T A G C C T C T T C T G C A A A G C A T C A A G A T T C G C C T T

HUM: C A C T G A C T A C A G C A T A - A A T T G A G C C C A G A T G G C T G G G G G A C A G A G G C T G
UAM: C A C T G A C T A C A G C A - A G A A T T G A G C C C A G A T G G C T G G A G G A G A G A G G C T G

HUM: G A G T G G G T G G T A A C A G T G A T T G A T T C A A G T G G A A G T T C T C A G T G A T A T T C
UAM: G A G T G G G T G G T A A C A G T G A T T G A T T C A A G T G T A A G T T C T C A G T G A T A C T C

HUM: T G C A T C A G C A T A A T G A A G A T T C A C A A T T C C C A G G G A C A C C A A T T A C C A G C
UAM: T G C A T C A G C A C A A T G A A G A T T C A C A A T T C C C A G G G A C A C C A A T T A C C A G C

HUM: A C A G T C T C C C T T A A A A T A A T C T A C T - T G G A A G C T G A G G G G G C T C T C A C A G
UAM: A C A G T C T C C C T T A A A A T A A T C T - C T T T G C A A G C T G A G G G G G C T C T C A C A G

HUM: G G G T A G G C A G T G T A T T A C T G T G A G A G A
UAM: A G G T A G G C A G T G T A T T A C T - - - G A G A

D7

HUM: C A C A G C G
UAM: C A C A G C G

D9

HUM: A C A G A A A C C T C
UAM: A C A G A A A C C T T

IGHVIII-67-2

GENE ALIGN SEQ

HUM:	G	A	T	T	T	A	T	T	G	T	C	T	C	C	A	G	A	G	A	C	A	A	T	G	T	C	A	A	G	A	A	T	A	T	G	C	T	A	T	A	T	C	T	G	C	A	A	A	T	G
UAM:	G	A	T	T	T	A	T	C	A	T	C	T	C	C	A	G	A	G	A	C	A	A	T	G	T	C	A	A	G	A	A	T	A	T	G	C	T	G	T	A	T	C	T	G	C	A	A	A	T	G

HUM:	G	G	C	G	A	T	C	T	G	T	A	A	A	C	C	A	A	G	A	A	C	A	C	A	T	C	A	G	T	A	T	A	T	C	A	C	T	G	T	G	C	A	A	G	A	G	G	A	G
UAM:	G	G	C	A	A	T	C	T	G	T	A	A	A	C	C	A	A	G	A	A	C	A	C	A	T	C	A	G	T	A	T	A	T	C	A	C	T	G	T	G	C	A	A	G	A	G	G	A	G

D7

HUM:	C	A	C	A	T	G	A
UAM:	C	A	C	A	T	G	A

D9

HUM:	A	C	A	T	A	A	A	C	C	T	C
UAM:	A	C	A	T	C	A	A	C	C	T	C

IGHVII-67-1

GENE ALIGN SEQ

HUM: A T G T C C T A T T C A G G A G C A G C T A C A G C A G T C A T G C C T A G G T G T G A A G A T C A
UAM: A T A T C C T A T T C A G G A G C A G C T A C A G C A G T C A T G C C T A G A T G T G A A G A T C A

HUM: C A C A C T G A C C T C A C C C A T G C T G T C T C T G G C C A C T T C A T C A C A A C C A A T G C
UAM: C A C A C T G A C C T C A C C C A T G C T G T C T C T G G C C A C T T C A T C A C A A C C A A T G C

HUM: T T A A T A T T G G A C G T G G A T C T G C C A G T C C C C G G G G A A T G G G T T G A A T G G A T
UAM: T T A A T A C T G G A C G T G G A T C T G C C A G T C C C C A G G G A A T G G G T T G A A T G G A T

D7

HUM: A A A A T G C
UAM: A A A A T G C

D9

HUM: C A T T C C T A C T G
UAM: C A G T C C T A C T G

IGHV1-67

GENE ALIGN SEQ

HUM:	A	T	G	G	A	G	T	G	G	A	C	T	T	G	G	A	G	G	A	T	C	C	T	A	A	T	T	T	T	G	G	T	G	G	T	C	G	T	A	G	C	T	G	C	A	G	G	T	A	G	
UAM:	A	T	G	A	A	G	T	G	G	A	C	T	T	G	G	A	G	G	A	T	C	C	T	A	A	T	T	T	T	G	G	T	G	G	T	T	G	T	A	G	C	T	G	C	A	G	G	T	A	G	
HUM:	G	A	T	A	A	T	T	C	T	C	A	G	T	C	C	C	C	A	G	G	A	C	T	-	-	-	-	A	A	G	G	T	G	A	C	T	G	G	G	T	C	C	A	G	T	C	A	A	A	G	
UAM:	G	A	T	A	A	T	T	C	T	C	A	G	T	C	C	C	C	A	G	G	A	C	T	G	A	G	G	-	A	A	G	G	T	G	A	C	T	G	G	T	T	C	C	A	G	T	C	A	A	A	G
HUM:	G	G	G	G	T	T	T	T	A	T	C	C	A	C	T	C	C	C	G	T	G	T	C	C	T	C	T	C	C	A	C	A	G	G	T	G	C	C	C	A	G	T	C	C	C	A	G	G	T	G	
UAM:	G	G	G	G	T	T	T	T	A	T	C	C	A	C	T	C	C	T	G	T	G	T	C	C	T	C	T	C	C	A	C	A	T	G	T	G	C	C	C	A	G	T	C	C	C	A	G	G	T	A	
HUM:	C	A	G	C	T	G	G	T	G	C	A	G	T	C	T	G	G	G	G	A	-	-	-	T	G	A	G	A	T	G	A	A	G	A	A	A	G	G	C	T	G	G	G	G	C	A	T	C	A	G	T
UAM:	C	A	G	C	C	G	G	T	G	A	A	G	T	C	T	G	-	-	-	A	G	G	C	T	G	A	G	A	T	G	A	A	G	A	A	G	G	C	T	G	G	G	G	C	A	T	C	A	G	T	
HUM:	G	A	A	A	G	T	C	T	C	C	T	G	C	A	A	G	A	C	T	T	G	T	G	G	A	T	A	C	A	C	C	T	A	C	C	T	T	C	A	C	C	A	G	T	T	A	C	T	C	T	
UAM:	G	A	A	A	G	T	C	T	C	C	T	G	C	A	A	G	A	C	T	T	G	T	G	G	A	T	A	C	A	C	C	-	-	-	-	T	T	C	A	C	C	A	G	T	T	A	C	T	G	T	
HUM:	A	T	G	C	A	C	T	A	G	G	T	G	C	G	C	C	A	G	G	C	C	C	A	T	G	C	A	C	A	A	G	G	G	C	T	T	G	A	G	T	G	G	A	T	G	G	G	A	A	G	
UAM:	A	T	G	C	A	C	T	G	G	G	T	G	C	G	C	C	A	G	G	C	C	C	A	T	G	C	A	C	A	A	C	G	G	C	T	T	G	A	G	T	G	G	A	T	G	G	G	A	A	G	
HUM:	G	A	T	G	T	G	C	C	C	T	A	G	T	G	A	T	G	G	C	A	G	C	A	T	A	A	G	C	T	A	C	G	C	A	G	A	G	A	A	G	T	T	C	C	A	G	G	G	C	A	
UAM:	G	A	T	G	T	G	C	C	C	T	A	G	T	G	A	T	G	G	C	A	G	C	A	C	A	A	G	C	T	A	C	G	C	A	G	A	G	A	A	G	T	T	C	C	A	G	G	G	C	A	
HUM:	G	A	G	T	C	A	C	C	A	T	G	A	C	C	A	G	G	G	A	C	A	C	A	T	C	C	A	C	G	A	G	C	A	C	A	G	C	C	T	A	C	A	T	G	G	A	G	C	T	G	
UAM:	G	A	G	T	C	A	C	C	A	T	T	A	C	C	A	G	G	A	A	C	A	C	A	T	C	C	A	C	A	A	G	C	A	C	A	G	C	C	T	A	C	A	T	G	G	A	G	C	T	G	
HUM:	A	G	C	A	G	C	C	T	G	A	G	A	T	C	T	G	A	A	G	A	C	A	C	G	G	C	C	A	T	G	T	A	T	T	-	-	A	C	T	G	T	G	G	G	A	G	A	G	A		
UAM:	A	G	C	A	G	C	C	T	G	A	G	A	T	C	T	G	A	A	G	A	C	A	C	G	G	C	C	A	C	G	T	A	T	T	T	A	A	C	T	G	T	G	G	G	A	G	A	G	A		

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	G	T	C	A	G	T	A	A	C	C	C
UAM:	G	T	C	A	G	T	A	A	C	C	C

IGHV3-66

GENE ALIGN SEQ

HUM: A T G G A G T T T G G G C T G A G C T G G G T T T T C C T T G T T G C T A T T T T A A A A G G T G A
UAM: A T G G A G T T T G G G C T G A G C T G G G T T T T C C T T G T T G C T A T T T T A A A A G G T G A

HUM: T T C A T G G A G A A C T A G A G A T A T T G A G T G T G A G T G A A - C A - - - C G A G T G A G
UAM: T T C A T G G A G A A C T A G A C A T A T T G - - - - - T G A A T C A A T A T - G A G T G A G

HUM: A G A A A C A G T G G A T - - - - - A T G T G T G G C A G T T T C T A A C C A A T G T C T C
UAM: A G A A A C A G T G G A T T T G T G T G G C - - G T G T G G C A G T T T C T A A C C A A T G T C T C

HUM: T G T G T T T G C A G G T G T C C A G T G T G A G G T G C A G C T G G T G G A G T C T G G A G G A G
UAM: T G T G T T T G C A G G T G T C C A G T G T G A G G T G C A G C T G G T G G A G T C T G G G G A G A G

HUM: G C T T G A T C C A G C C T G G G G G G T C C C T G A G A C T C T C C T G T G C A G C C T C T G G G
UAM: G C T T G G T A C A G C C T G G G G G G T C C C T C A G A C T C T C C T G T G C A G C C T C T G G A

HUM: T T C A C C G T C A G T A G C A A C T - A C A T G A G C T G G G T C C G C C A G G C T C C A G G G A
UAM: T T C A C C G T C A G T A G C A A - T G A G A T G A G C T G G A T C C G C C A G G C T C C A G G G A

HUM: A G G G G C T G G A G T G G G T C T C A G T T A T T - - T A T A G C T G T G G T A G C A C A T A C T
UAM: A G G G G C T G G A G T G G G T C T C A A C C A T T A G T A T A G - - G T G G T A G C A C A T A C T

HUM: A C G C A G A C T C C G T G A A G G G C C G A T T C A C C A T C T C C A G A G A C A A T T C C A A G
UAM: A C A C A G A C T C C G T G A A G G G C A G A T T C A C C A T C T C C A G A G A C A A T T C C A A G

HUM: A A C A C G C T G T A T C T T C A A A T G A A C A G C C T G A G A G C T G A G G A C A C G G C T G T
UAM: A A C A C G C T G T A T C T T C A A A T G A A C A G C C T G A G G G C T G A G G A C A C G G C T G T

HUM: G T A T T A C T G T G C G A G A G A
UAM: G T A T T A C T G T G C G A A A G A

D7
HUM: C A C A G T G
UAM: C A C A G T G

D9
HUM: G A C A C A A A C C T
UAM: G A C A C A A A C C T

IGHVII-65-1

GENE ALIGN SEQ

HUM: G G G C T A G T G A A G C T C T C A C A G A C C C T C T C T C T C A C C T G T G C T G T C T C T G C
UAM: G G G C T A G T G A A G C T C T C A C C G A C C C T C T C T C T C A C C T G T G C T G T C T C T G C

HUM: A T T C T C C A T C A C A A C C A G T G C T T C C T G C T G G A G C T G C A T C C A T C A - C C C C
UAM: A T T C T C C A T C A C A A C C A G T G - T T C C T G C T G G A A C T G C A T C C A T C A G C C C C

HUM: C C G C A A G G A A G G G A C T G G A G C G A A T C A G G T G C A C A G G T C A T G A G G G A G T G
UAM: C C - C A A G G A A G G G A C T G G A G T G A A T C A G G T G C A C A G G T C A T G A G G G A G T G

HUM: C A C A T T C C A A C C C A C T C C T C A A G A G T C C A G T C A C T A T C T C C A G A T C C A C A
UAM: C A C A A T C C A A C C C A C T C C T C A A G A G T C C A G T C A C C A T C T C C A G A T C C A C A

HUM: T C C A A A A A C A G T G T T T C C T G T A G C T G A G C T A C C T G A G C A A C A - - - A G T A
UAM: T C C A A A A A C A G T G T T T C C T A C A G C T G A G C T A C C T G - - - A A C A A C G A G T A

HUM: C A C A A C C A T G A - - A T T T T A A T A C A A A A G A
UAM: C A C A A C C A T G A G T - T T T T A - T A C A A A A G A

D7

HUM: C A C A A C G
UAM: T A C A G C G

D9

HUM: G A T A C A A A C C T
UAM: G A T A C A A A C C T

IGHV3-65

GENE ALIGN SEQ

HUM: A T G A A G T C T G G G C T G A G C C G G T T T T T C C T T G T T G C T A T T T T A A A A G A T A A
UAM: - - G G A G T C T G G G C T G A G C T G G T T T T T C C T T G T T A C T A T T T T A A A A G A T A A

HUM: T T A A T G G T G A A C T A G A G A T A C T T A G T G T G A G G G G A C A T G A G T G A G A G A A A
UAM: T T A A T G G T G A A C T A G A G A T A C T T A G T G T G A G G G G A C A T G A G T G A G A G A A A

HUM: C A G T G G A T A G T G T G G C A G T T T C T G A T C A C G A T G T C T C T G G A G G T G T C C A G
UAM: C A G T G G A T A G T G T G G C A G T T T C T G A T C A C G A T G T C T C T G C A G G T G T C C A G

HUM: T G T G A G G T G C A G C T G G T G G A G T C T G G G G G A G G C T T G G T A C A G C C T G G G G G
UAM: T G T G A A G T G C A G C T G G T G G A G T C T G G G G G A G G C T T G G T A C A G C C T G T G G G

HUM: G T C C C T G A G A C T C T C C T G T G C A G C C T C T G G A T T C A C C T T C C G T T A A C T A C
UAM: G T C C C T G A G A C T C T C C T G T G C A G C C C C T G G A T T C A C C T T C A G - T A A C T A C

HUM: T G C A T G C A G T G G A T C T G - - - C C - - - G G G C T C C A G G A A A G G G G C T G G A G -
UAM: T A C A T G C A - - - - - C T G G G T C C A C T A - G G C T C C A G G A A A G G G G C T - - A G A

HUM: - T G G G T A G G T T T C A C T A A A A A C A A A A C T A A T C G T G G A A C A A C A G A A T A C G
UAM: A T G G G T A G G T T T C A T T A G A A A C A A A G C T A A T G G T G G G A C A A C A G A A T A C G

HUM: C C G C G T C T G T G A A A G G C A G A T T C A C C A T C T C A A G C G A T G A T T C C A A A A G C
UAM: C C G C G T C T G T G A A A G G C A G A T T C A C T A T C T C A A G A G A T G A T T C C A A A A G C

HUM: A T C G C C T A T C T G C A A A T G A A C A G C C T G A A A A C C G A G G A C A C G G C C G T G T A
UAM: A T C G C C T A T C T G C A A A T G A G C A G C C T G A A A A C C A A G G A T A C G A C C G T G T A

HUM: T T A C T A T A C C A G A G A C A C A G T G A G G G G A G G T C A G T G T G A G T C C A G A C A C A
UAM: T T A C T G T G C C A G A G A C A C A G T G A G G G G A G G T C A G T G T G A G C C C A G A C A C A

HUM: A A C C
UAM: A A C C

D7

HUM: T C C C T G C
UAM: T C C C T G C

D9

HUM: G G C G G T C A A A A
UAM: T G G G G G C G G T C

IGHV3-64

GENE ALIGN SEQ

HUM:	A	T	G	G	A	G	T	T	T	G	G	G	C	T	G	A	G	C	T	G	G	G	T	T	T	T	C	C	T	T	G	T	T	G	C	T	A	T	T	T	T	A	A	A	G	G	T	G	A	
UAM:	A	T	G	G	A	G	T	T	T	G	G	G	C	T	G	A	G	C	T	G	G	G	T	T	T	T	C	C	T	T	G	T	T	G	C	T	A	T	T	T	T	A	A	A	G	G	T	G	A	
HUM:	T	T	C	A	T	G	A	G	G	A	A	A	T	A	G	A	G	A	T	A	T	T	G	A	G	T	G	T	G	A	G	T	G	G	A	C	A	T	G	A	G	T	G	A	G	A	A	A		
UAM:	T	A	C	A	T	G	A	G	G	A	A	A	T	A	G	A	G	A	T	A	T	T	G	A	G	T	G	T	G	A	G	T	G	G	A	C	A	T	G	A	G	T	G	A	G	A	A	A		
HUM:	C	A	G	T	G	G	A	T	T	T	G	T	G	T	G	G	C	A	G	T	T	T	C	T	G	A	C	C	T	T	G	G	T	G	T	C	T	C	T	G	T	G	T	T	T	G	C	A	G	G
UAM:	C	A	G	T	G	G	A	T	T	T	G	T	G	T	G	G	C	A	G	T	T	T	C	T	G	A	C	C	T	T	G	G	T	G	T	C	T	T	T	T	G	T	T	T	G	C	A	G	G	
HUM:	T	G	T	C	C	A	G	T	G	T	G	A	G	G	T	G	C	A	G	C	T	G	G	T	G	G	A	G	T	C	T	G	G	G	G	A	A	G	G	C	T	T	G	G	T	C	C	A	G	C
UAM:	T	G	T	C	C	A	G	T	G	T	G	A	G	G	T	G	C	A	G	C	T	G	G	T	G	G	A	G	T	C	T	G	G	G	G	A	A	G	A	C	T	T	G	G	T	A	C	A	G	C
HUM:	C	T	G	G	G	G	G	T	C	C	C	T	G	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	G	A	T	T	C	A	C	C	T	T	C	A	G	T	
UAM:	C	T	G	G	G	G	G	T	C	C	C	T	A	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	G	A	T	T	C	A	C	C	T	T	C	A	G	T	
HUM:	A	G	C	T	A	T	G	C	T	A	T	G	C	A	C	T	G	G	G	T	C	C	G	C	C	A	G	G	C	T	C	C	A	G	G	A	A	G	G	G	A	C	T	G	G	A	-	A	T	
UAM:	A	G	C	T	A	T	G	C	T	A	T	G	C	A	C	T	G	G	G	T	C	C	G	C	C	A	G	G	C	A	C	C	A	G	G	A	A	G	G	G	T	C	T	G	G	A	G	-	-	
HUM:	A	T	G	-	-	T	T	-	T	C	A	G	C	T	A	T	T	-	A	G	T	A	G	T	A	A	T	G	G	G	G	T	A	G	C	A	C	A	T	A	T	T	A	T	G	C	A	G	A	
UAM:	-	T	G	G	G	-	T	C	T	C	A	G	T	T	A	T	T	T	A	-	T	A	G	T	G	G	T	G	G	G	A	G	T	A	G	C	A	C	A	T	A	C	T	A	T	G	C	A	G	A
HUM:	C	T	C	T	G	T	G	A	A	G	G	G	C	A	G	A	T	T	C	A	C	C	A	T	C	T	C	C	A	G	A	G	A	C	A	A	T	T	C	C	A	A	G	A	A	C	A	C	G	C
UAM:	C	T	C	T	G	T	G	A	A	G	G	G	C	A	G	A	T	T	C	A	C	C	A	T	C	T	C	C	A	G	A	G	A	C	A	A	T	G	C	C	A	A	G	A	A	C	A	C	A	C
HUM:	T	G	T	A	T	C	T	T	C	A	A	A	T	G	G	G	C	A	G	C	C	T	G	A	G	A	G	C	T	G	A	G	G	A	C	A	T	G	G	C	T	G	T	G	T	A	T	T	A	C
UAM:	T	G	T	A	T	C	T	T	C	A	A	A	T	G	A	A	C	A	G	T	C	T	G	A	G	A	G	C	T	G	A	G	G	A	C	A	C	G	G	C	T	G	T	C	T	A	T	T	A	C
HUM:	T	G	T	G	C	-	-	-	G	A	G	A	G	A																																				
UAM:	T	G	T	G	C	A	A	A	-	A	G	A	C	A																																				

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	T	G	C	A	G	A	A	A	C	C	T
UAM:	T	A	C	A	G	A	A	A	C	C	T

IGHV3-63

GENE ALIGN SEQ

HUM: A T G G G G T T T G A G C T A A C C A G A A T T T T T C T T G T T G C T A T T T T A A A A G G T G A
UAM: A T G G G G T T T G A G C T A A G C A G A A T T T T T C T T G T A G C T A T T T T A A A A G G T G A

HUM: C T C A T A G A G A A A T A G A G T G A G T G A G A G T G A G T G G A T A T A A G T G A G A A A A A
UAM: C T C A T A G A G A A A T A G A G T G A G - - - A G T G A G T G G A T A T G A G T G A G A G A A A

HUM: C A G T A G A T G T G T T T G G C A G T T T C T G A C C A G G A C G T T T G T G T A T T T T C A G G
UAM: C A G T A G A T G T G T T T G G C A G T T T C T G A C C A G G A T G T T G G T G T A T T T T C A G G

HUM: T G T T C A G T G T G A G G T G G A G C T G A T A G A G T C C A T A G A G G G C C T G A G A C A A C
UAM: T G T T C A G T G T G A G G T G C A G C T G A T A G A G T C C A T A G A G G A C C T G A G A C A A C

HUM: T T G G G A A G T T C C T G A G A C T C T C C T G T G T A G C C T - C - T G G A T T C A C C T T C A
UAM: C T G G G A A G T T C C T G A G A C T C T C C T G T G T A G C C T A C A - - G A T T C A C C T T C A

HUM: G T A G C T A C T G A A T G A G C T G G G T C A A T G A G A C T C T A G G G A A G G G G C T G G A G
UAM: G T A A C T A C T G A A T G A G C T G G A T C A A T G A G A C T C T A G G G A A G G G G C T G G A G

HUM: G G A G T A A T A G A T G T A A A A T A T G A T G G A A G T C A G A T A T A C C A T G C A G A C T C
UAM: G G A G T A A T A G A T G T A A A A T A C G A T G G A A G T C A G A T A T A C C A T G C A G A C T C

HUM: T G T G A A G G G C A G A T T C A C C A T C T C C A A A G A C A A T G C T A A G A A C T C A C C G T
UAM: T G T G A A G G G C A G A T T C A C C A T C T C C A A A G A A A A T G C T A A G A A C T C G C C G T

HUM: A T C T G C A A A C G A A C A G T C T G A G A G C T G A G G A C A T G A C C A T G C A T G G C T G T
UAM: A A C T G C A A A C G A A C A G T C T G A G A G C T G A G G A C A T G G C C A T G C A C G G C T G T

HUM: A C A T A A G G T T C C A A G T G A G G
UAM: A C A T A A G G T T C C A A G T G A G A

D7

HUM: A A A C A T C
UAM: A A A C A T C

D9

HUM: T T C C T G C A G A A
UAM: T T C C T G C A G A A

IGHVII-62-1

GENE ALIGN SEQ

HUM: G G C C T G G T G A A G C C C T C A C A G A C C C T C T C C C T C A T G T G T G T C A T C T C T G C
UAM: G G C C T G G T G A A G C C C T C A C A G A C C C T C T C C C T C C T G T G T G C C A T C T C T G C

HUM: A T T C T C C A T C A C A A C C A G T G C T T C C T C C T G G A G C T G C A T C C A T C A G C C C C
UAM: A T T C T C C A T C A C A A C C A G T G T T T C C T C C T G G A G C T G C A T C C C T C A G C C C -

HUM: T C T C - - T G G G A G G G A A T G G A G T G G A T T G G G T G C A T A G G T C A T G A A G G G A G
UAM: - - T C A C - G G G A G G G A A T G G A G T G G A T C G G G T G C A T A G G T C A C G G A G G G A G

HUM: C A C A C A T T A C T C C C C T T T C C T C A A G A G T C C A G T C A C C A T C C C C A G A T C C A
UAM: C A C A C A T T A C T C C C C T C T C C T C A A G A G T C C A G T C A C C A T C C C C T G A T C C A

HUM: T G T C C A A A A C A G T T C T T C C T A C A G C T G A G C T A C A T G A G C A A C A A T C A C A
UAM: T G T C C A A A A C A G T T C T T C C T A C A G C T G A G C T A C A T G A G C A A T A A T C A C A

HUM: T A G C C A T A T A T T T T T A A G C A A A A G A
UAM: T A G C C A C G T A T T T T T T A A G C A A A A G A

D7

HUM: C A C A G T G
UAM: C A C A G T G

D9

HUM: C A C C A A A A C C T
UAM: C A C C A A A A C C T

IGHV4-61

GENE ALIGN SEQ

HUM:	A	T	G	A	A	A	C	A	C	C	T	G	T	G	G	T	T	C	T	T	C	C	T	C	C	T	G	G	T	G	G	C	A	G	C	T	C	C	C	A	G	A	T	G	T	G	A										
UAM:	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	A										
HUM:	G	T	G	T	C	T	C	A	G	G	G	A	T	C	C	A	G	A	C	A	T	G	G	G	G	T	A	T	G	G	G	A	G	G	T	G	C	C	T	C	T	G	A	T	C	C	C	A	G								
UAM:	G	T	G	T	C	T	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-									
HUM:	G	G	C	T	C	A	C	T	G	T	G	-	-	G	G	T	C	T	C	T	C	T	G	T	T	C	A	C	A	G	G	G	G	T	C	C	T	G	T	C	C	C	A	G	G	T	G	C	A	G							
UAM:	-	-	-	-	C	A	C	T	G	T	G	C	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C	A	G							
HUM:	C	T	G	C	A	G	G	A	G	T	C	G	G	G	C	C	C	A	G	G	A	C	T	G	G	T	G	A	A	G	C	C	T	T	C	G	G	A	G	A	C	C	C	T	G	T	C	C	C	T							
UAM:	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-									
HUM:	C	A	C	C	T	G	C	A	C	T	G	T	C	T	-	-	-	C	T	G	G	T	G	G	C	T	C	C	G	T	C	A	G	C	A	G	T	G	G	T	A	G	T	T	A	C	T	A	C								
UAM:	-	-	-	-	-	-	C	A	C	T	G	T	C	T	G	G	A	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
HUM:	T	G	G	A	G	C	T	-	-	-	-	-	-	-	G	G	-	-	-	A	T	C	-	-	-	C	G	G	C	A	G	C	C	-	C	-	C	C	A	G	G	-	G	A	A	G	G	G	A								
UAM:	-	G	G	A	G	C	T	C	C	C	A	G	C	A	T	G	G	G	T	G	-	T	C	T	T	T	-	G	G	C	A	-	-	C	A	C	A	C	C	A	G	G	T	-	-	-	-	-	G	A							
HUM:	C	-	-	-	T	G	-	-	-	G	A	G	T	G	G	A	T	T	G	G	G	T	A	T	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	T	C	T	A	T	T	A	C	A	
UAM:	C	G	G	G	T	G	T	T	A	G	A	G	T	G	C	A	-	-	-	-	G	T	A	C	A	G	C	A	G	C	T	G	G	C	G	G	T	C	T	G	G	T	C	T	A	T	T	-	-	-	-	-	-				
HUM:	G	T	G	G	G	A	G	C	A	C	C	A	A	C	T	A	C	A	A	C	C	C	C	T	C	C	C	T	C	A	A	G	A	G	T	C	G	A	G	T	C	A	C	C	A	T	A	T	C	A							
UAM:	-	-	G	G	G	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
HUM:	G	T	A	G	A	C	A	C	G	T	C	C	A	A	G	A	A	C	C	A	G	T	T	C	T	C	C	C	T	G	A	A	G	C	T	G	-	-	-	-	-	-	-	-	-	-	-	-	-								
UAM:	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C	T	C	C	C	T	G	A	T	G	C	T	G	G	A	G	G	G	A	T	A	A	G	A	G	G	T		
HUM:	A	G	C	-	-	T	C	T	G	T	G	A	C	C	G	C	T	G	C	G	G	A	C	A	C	G	G	C	C	-	G	T	G	T	A	-	T	T	A	C	T	G	T	-	-	-	-	G	-	-							
UAM:	-	G	C	A	T	T	C	T	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C	A	G	G	G	C	C	A	-	-	G	C	A	C	-	-	A	C	T	G	T	T	T	A	T	G	G	A		
HUM:	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C	G	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	A	G	A	-	-	G	A
UAM:	T	T	T	T	T	T	A	T	A	T	A	A	A	A	A	C	T	A	T	-	G	A	T	T	T	T	A	C	T	T	C	A	T	T	T	T	C	T	C	A	G	A	G	A	T	A	-	-	A	-	-	-	-				

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	G	A	C	A	C	A	A	A	C	C	T
UAM:	A	A	T	T	G	T	G	A	T	G	T

IGHVII-60-1

GENE ALIGN SEQ

HUM: G G C C T G G T G G A G C C C T C G C A G A C C C T C T C C C T C A C C T G T G C T G T C T C T G G
UAM: G G C C C G G T G G A G C C C T A G C A G A C C C T C T C C C T C A C C T G T G C T G T C T C T G G

HUM: A T T T T C C A T C A C A A C C A G T G T T T C C T G C T G G A G C T G G A T C C A C G A G T C C A
UAM: A T T T T C C A T C A C A A C C A G T G C T T C C T G C T G G A G C T G G A T C C A C G A G T C C A

HUM: C A T G G G A A G G A C T G G A G T G G A C C A G G C G C A C A C G T C A T G A A G G G A G C A A A
UAM: C A T G G G A A G G A C T G G G G T G G A C C A G G T G C A C A C G T C A T G A A G G G A G C A A A

HUM: A A T T C C C A C C C A C T C C T T A T G A A T C C A G T C A C C A T C T C C A A A T T C G G G T C
UAM: A A T T C C C A C C C A C T C C T T A T G A A T C C A G T C A C C A T C T C C A A A T T C G G G T C

HUM: C A A A A A A C A C T T G T T T T T A C A G T G G A G C T A T G T G A G C A A C A A G C T C A C A G
UAM: C A A A A A - C A C T T G T T T T T A C A G T G G A G C T A T G T G A G C A A C A A A C A C A C A G

HUM: C C A T G - - - T T T T A A A G A A G A G A
UAM: C C C T G T A T T T T T A A A G A A G A G A

D7

HUM: C A G A G T G
UAM: C A G A G T G

D9

HUM: C A C C C A A A C C T
UAM: C A C C C A A A C C T

IGHV3-60

GENE ALIGN SEQ

HUM:	A	T	G	G	A	G	T	C	T	G	G	G	C	T	G	A	G	C	T	G	G	A	T	T	T	T	C	C	T	T	G	T	T	G	C	A	G	T	T	T	T	A	A	A	A	G	G	T	G	A	
UAM:	A	T	G	G	A	G	T	C	T	C	G	G	C	T	G	A	G	C	T	G	G	G	T	T	T	T	C	C	T	T	G	T	T	G	C	A	A	T	T	T	T	A	A	A	A	G	G	T	G	A	
HUM:	T	T	T	A	T	G	G	A	G	A	A	T	G	A	G	A	C	A	C	A	C	T	G	A	G	T	G	T	G	A	C	T	G	G	A	C	A	T	A	A	G	T	G	A	G	A	A	A			
UAM:	T	T	T	A	T	G	G	A	G	A	A	T	G	A	G	A	G	A	C	A	C	T	G	A	G	T	G	T	G	A	C	T	G	G	A	C	A	T	G	A	G	T	G	A	A	A	G	A	A	A	
HUM:	C	A	G	-	T	G	G	A	T	T	T	G	T	G	T	G	G	C	A	G	T	T	T	C	T	G	A	C	C	A	G	G	G	T	G	T	C	T	C	C	G	T	G	T	T	T	G	C	A	G	
UAM:	C	A	G	A	T	-	G	A	T	T	T	G	T	G	T	G	G	C	A	G	T	T	T	C	T	G	A	C	C	A	G	G	G	T	G	T	C	T	C	T	G	T	G	T	T	T	G	C	A	G	
HUM:	G	T	G	T	C	C	A	G	T	G	T	G	A	G	G	T	G	C	A	G	C	T	G	G	T	G	G	A	G	T	C	T	G	G	G	G	A	G	G	C	T	T	A	G	T	A	A	A	G		
UAM:	G	T	G	T	C	C	A	G	T	G	T	G	A	G	G	T	G	C	A	G	C	T	G	G	T	G	G	A	G	T	C	T	A	G	G	G	A	G	G	C	T	T	A	G	T	A	A	A	G		
HUM:	A	C	T	-	-	-	-	-	-	-	-	G	G	A	G	G	G	G	T	C	T	C	T	G	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	G	A	T	T	C
UAM:	A	C	T	T	G	G	G	G	G	C	-	-	-	G	G	G	G	T	C	T	C	T	G	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	G	A	T	T	C	
HUM:	A	C	C	T	T	C	A	G	T	A	G	C	T	C	T	G	C	T	A	T	G	C	A	C	T	G	G	G	T	C	C	A	C	C	A	G	G	C	T	C	C	A	G	G	A	A	A	G	G	G	
UAM:	A	C	C	T	T	C	A	G	T	A	G	C	T	A	T	G	C	T	A	T	G	A	A	C	T	G	G	G	T	C	C	G	C	C	A	G	G	C	T	C	C	A	G	G	A	A	A	G	G	G	
HUM:	T	T	T	G	G	A	G	T	G	G	G	T	C	T	C	A	G	T	T	A	T	T	A	G	T	A	C	A	A	G	T	G	G	T	G	A	T	A	C	C	G	T	A	C	T	C	T	A	C	A	
UAM:	T	T	T	C	G	A	G	T	G	G	G	T	C	T	C	A	G	T	T	A	T	T	A	G	T	A	C	A	A	G	T	G	G	T	G	G	T	A	C	C	A	A	A	C	T	C	T	A	C	A	
HUM:	C	A	G	A	C	T	C	T	G	T	G	A	A	G	G	G	C	T	G	A	T	T	C	A	C	C	A	T	C	T	C	T	A	G	A	G	A	C	A	A	T	G	C	C	C	A	G	A	A	T	
UAM:	C	A	G	A	C	T	C	T	G	T	G	A	A	G	G	G	C	C	G	A	T	T	C	A	C	C	A	T	C	T	C	C	A	G	A	G	A	C	A	A	T	G	T	C	C	A	G	A	A	C	
HUM:	T	C	A	C	T	G	T	C	T	C	T	G	C	A	A	A	T	G	A	A	C	A	G	C	C	T	G	A	G	A	G	C	C	G	A	G	G	G	C	A	C	A	-	G	-	-	T	T	G	T	
UAM:	T	C	A	C	T	G	T	A	T	C	T	G	C	A	A	A	T	G	A	A	C	A	G	C	C	T	G	A	G	A	G	C	C	G	A	G	G	-	-	A	C	A	C	G	G	C	-	T	G	T	
HUM:	G	T	A	C	T	A	C	T	G	T	G	-	T	G	A	A	A	G	A																																
UAM:	G	T	A	T	T	A	C	T	G	T	G	C	-	-	-	A	A	G	A																																

D7

HUM:	C	G	C	A	G	T	G
UAM:	G	A	G	G	C	A	G

D9

HUM:	A	C	A	A	A	C	C	T	C	C	T
UAM:	A	C	A	C	A	A	A	C	C	T	C

IGHV4-59

GENE ALIGN SEQ

HUM:	A	T	G	A	A	A	C	A	T	C	T	G	T	G	G	T	T	C	T	T	C	C	T	C	T	C	C	T	G	G	T	G	G	C	A	G	C	T	C	C	C	A	G	A	T	G	T	G	A	
UAM:	A	T	G	A	A	A	C	A	C	C	T	G	T	G	G	T	T	C	T	T	C	C	T	C	C	T	C	C	T	G	G	T	G	G	C	A	G	C	T	C	C	C	A	G	A	T	G	T	G	A
HUM:	G	T	A	T	C	T	C	A	G	G	G	A	T	C	C	A	G	A	C	A	T	G	G	G	A	T	A	T	G	G	G	A	G	G	-	T	G	C	C	T	C	T	G	A	T	C	C	C	A	
UAM:	G	T	G	T	C	T	C	A	G	G	G	A	T	C	C	A	G	A	C	A	T	G	G	A	G	A	T	A	T	G	G	G	A	G	G	C	T	G	C	C	T	C	T	G	A	T	C	C	C	A
HUM:	G	G	G	C	T	C	A	C	T	G	T	G	G	G	T	C	T	C	T	C	T	G	T	T	C	A	C	A	G	G	G	G	T	C	C	T	G	T	C	C	C	A	G	G	T	G	C	A	G	C
UAM:	G	G	G	C	T	C	A	C	T	G	C	G	G	G	T	C	T	C	T	C	T	G	T	T	C	A	C	A	G	G	G	G	T	C	C	T	G	T	C	C	C	A	G	G	T	G	C	A	G	C
HUM:	T	G	C	A	G	G	A	G	T	C	G	G	G	C	C	C	A	G	G	A	C	T	G	G	T	G	A	A	G	C	C	T	T	C	G	G	A	G	A	C	C	C	T	G	T	C	C	C	T	C
UAM:	T	G	C	A	G	G	A	G	T	C	G	G	G	C	C	C	A	G	G	A	C	T	G	G	T	G	A	A	G	C	C	T	T	C	G	G	A	G	A	C	C	C	T	G	T	C	C	C	T	C
HUM:	A	C	C	T	G	C	A	C	T	G	T	C	T	C	T	G	G	T	G	G	C	T	C	C	A	T	C	A	G	T	A	G	T	T	A	C	T	A	C	T	G	G	A	G	C	T	G	G	A	T
UAM:	A	C	C	T	G	C	G	C	T	G	T	C	T	C	T	G	G	T	G	G	C	T	C	C	A	T	C	A	G	T	A	G	T	A	A	C	T	A	C	T	G	G	A	G	C	T	G	G	A	T
HUM:	C	C	G	G	C	A	G	C	C	C	C	C	A	G	G	G	A	A	G	G	G	A	C	T	G	G	A	G	T	G	G	A	T	T	G	G	G	T	A	-	T	A	T	C	T	A	T	T	A	C
UAM:	C	C	G	G	C	A	G	C	C	A	C	C	A	G	G	G	A	A	G	A	G	A	C	T	G	G	A	G	T	G	G	A	T	T	G	G	G	-	A	G	T	A	T	C	T	A	T	T	C	C
HUM:	A	G	T	G	G	G	A	G	C	A	C	C	A	A	C	T	A	C	A	A	C	C	C	C	T	C	C	C	T	C	A	A	G	A	G	T	C	G	A	G	T	C	A	C	C	A	T	A	T	C
UAM:	A	G	T	G	G	G	A	G	C	A	C	C	T	A	C	T	A	C	A	A	C	C	C	G	T	C	C	C	T	C	A	A	G	A	G	T	C	G	A	G	T	C	A	C	C	A	T	A	T	C
HUM:	A	G	T	A	G	A	C	A	C	G	T	C	C	A	A	G	A	A	C	C	A	G	T	T	C	T	C	C	C	T	G	A	A	G	C	T	G	A	G	C	T	C	T	G	T	G	A	C	C	G
UAM:	A	A	T	A	G	A	C	T	C	G	T	C	C	A	A	G	A	A	C	C	A	G	T	T	C	T	C	C	C	T	G	A	A	G	C	T	G	A	G	C	T	C	T	G	T	G	A	C	C	G
HUM:	C	-	T	G	C	G	G	A	C	A	C	G	G	C	C	G	T	G	T	A	T	T	A	C	T	G	T	G	C	G	A	G	A	G	A															
UAM:	C	C	T	-	C	G	G	A	C	A	C	G	G	C	C	G	T	G	T	A	T	T	A	C	T	G	T	G	C	G	A	G	A	G	A															

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	G	A	C	A	A	A	A	C	C	T
UAM:	G	A	C	A	A	A	A	C	C	T

IGHV1-58

GENE ALIGN SEQ

HUM:	A	T	G	G	A	C	T	G	G	A	T	T	T	G	G	A	G	G	A	T	C	C	T	C	T	T	C	T	T	G	G	T	G	G	G	A	G	C	A	G	C	G	A	C	A	G	G	C	A	A
UAM:	A	T	G	G	A	C	T	G	G	A	T	T	T	G	G	A	G	G	A	T	C	C	T	C	T	T	C	T	T	G	G	T	G	A	G	A	G	C	A	G	C	G	A	C	A	G	A	T	A	A
HUM:	G	G	A	G	-	-	A	T	G	C	C	A	A	G	T	C	C	C	A	G	T	G	A	T	G	A	G	G	A	G	G	G	A	T	T	G	A	G	T	C	C	A	G	T	C	A	A	G	G	
UAM:	G	G	-	G	G	C	-	T	G	C	C	A	A	G	T	C	C	C	A	G	T	G	A	T	G	A	G	G	A	G	G	T	G	A	T	T	G	A	G	T	C	C	A	G	T	C	A	A	G	G
HUM:	T	G	G	C	T	T	T	C	A	T	C	C	A	C	T	C	C	T	G	T	G	T	T	C	T	C	T	C	C	A	C	A	G	G	T	G	C	C	C	A	C	T	C	C	C	A	A	A	T	G
UAM:	T	G	G	C	T	T	T	C	A	C	C	C	A	C	T	C	C	T	G	T	G	T	T	C	T	C	T	C	C	A	C	A	G	G	T	G	C	A	C	A	C	T	C	C	C	A	A	A	T	G
HUM:	C	A	G	C	T	G	G	T	G	C	A	G	T	C	T	G	G	G	C	C	T	G	A	G	G	T	G	A	A	G	A	A	G	C	C	T	G	G	G	A	C	C	T	C	A	G	T	G	A	A
UAM:	C	A	G	C	T	T	G	T	G	C	A	A	T	C	T	G	G	G	C	C	T	G	A	G	G	T	T	A	A	G	A	A	G	C	C	T	G	G	G	G	C	C	T	C	A	G	T	G	A	A
HUM:	G	G	T	C	T	C	C	T	G	C	A	A	G	G	C	T	T	C	T	G	G	A	T	T	C	A	C	C	T	T	T	A	C	T	A	G	C	T	C	T	G	C	T	G	T	G	C	A	G	T
UAM:	G	G	T	C	T	C	C	T	G	C	A	A	G	G	C	T	T	C	T	G	G	A	T	A	C	A	C	C	T	T	T	A	C	T	A	G	C	T	C	T	G	C	T	A	T	G	C	A	G	T
HUM:	G	G	G	T	G	C	G	A	C	A	G	G	C	T	C	G	T	G	G	A	C	A	A	C	G	C	C	T	T	G	A	G	T	G	G	A	T	A	G	G	A	T	G	G	A	T	C	G	T	C
UAM:	G	G	G	T	G	T	G	A	C	A	G	G	C	T	C	C	T	G	G	A	C	A	A	G	G	C	C	T	T	G	A	G	T	G	G	A	T	A	G	A	A	T	G	G	A	T	C	A	T	C
HUM:	G	T	T	G	G	C	A	G	T	G	G	T	A	A	C	A	C	A	A	A	C	T	A	C	G	C	A	C	A	G	A	A	G	T	T	C	C	A	G	G	A	A	A	G	-	A	G	T	C	A
UAM:	G	T	T	G	G	C	A	G	T	G	G	T	A	A	C	G	C	A	A	A	C	T	A	C	G	C	A	C	A	G	A	A	G	T	T	C	C	A	G	G	-	-	-	G	C	A	G	T	C	A
HUM:	C	C	A	T	T	A	C	C	A	G	G	G	A	C	A	T	G	T	C	C	A	C	A	A	G	C	A	C	A	G	C	C	T	A	C	A	T	G	G	A	G	C	T	G	A	G	C	A	G	C
UAM:	C	C	A	A	T	A	C	C	A	G	G	G	A	C	A	C	G	T	C	C	A	C	G	A	G	C	A	C	A	G	C	C	T	A	C	A	T	G	G	A	G	C	T	G	A	G	C	A	G	C
HUM:	C	T	G	A	G	A	T	C	C	G	A	G	G	A	C	A	C	G	G	C	C	G	T	G	T	A	T	T	A	C	T	G	T	G	C	G	G	C	A	G	A									
UAM:	C	T	G	A	G	A	T	C	C	A	A	G	G	A	C	A	T	G	G	C	C	G	T	G	T	A	T	T	A	C	T	G	T	G	C	G	G	C	A	G	A									

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	G	T	C	A	G	A	A	A	C	G	C
UAM:	G	T	C	A	G	A	A	A	C	C	C

IGHV3-57

GENE ALIGN SEQ

HUM:	A	A	G	T	C	C	T	G	T	G	T	G	T	G	A	A	G	T	T	T	A	T	T	G	A	T	G	G	A	G	T	C	A	G	A	G	G	C	A	G	A	A	A	A	T	T	G	T	A	C	A	G		
UAM:	A	A	G	T	C	C	T	G	T	G	T	G	T	G	A	A	G	T	T	T	A	T	T	G	A	T	G	G	A	G	T	C	A	G	A	G	G	G	G	G	A	A	A	A	T	T	G	T	A	C	-	-		
HUM:	C	C	C	A	G	T	-	-	-	-	-	G	G	T	T	C	A	C	T	G	A	G	A	C	T	C	T	C	C	T	G	C	A	A	A	G	C	C	T	C	T	G	A	T	T	T	C	A	C	C				
UAM:	-	-	-	A	G	T	G	C	A	G	G	G	G	T	T	C	A	C	T	G	A	G	A	C	T	C	T	C	C	T	G	C	A	A	A	G	C	C	T	C	T	G	A	T	G	T	C	A	C	C				
HUM:	T	T	T	A	C	T	G	G	C	T	A	C	A	G	C	A	T	G	A	G	C	T	T	G	G	T	C	C	A	G	C	A	G	G	C	T	T	C	A	T	G	A	C	A	G	G	G	A	T	T				
UAM:	T	T	C	A	C	T	G	G	C	T	A	C	A	G	C	A	T	G	A	C	C	T	T	G	G	T	C	C	A	T	C	A	G	G	C	T	T	C	A	T	G	A	C	A	G	A	G	A	T	T				
HUM:	G	G	T	G	T	G	G	G	T	G	G	A	A	A	C	A	G	T	G	A	G	T	G	A	T	C	A	A	A	G	T	-	-	G	G	G	A	G	T	T	C	T	C	A	G	A	G	T	T	A	C			
UAM:	G	G	T	G	T	G	G	G	T	G	G	A	A	A	C	A	G	T	G	A	G	T	G	A	T	C	A	-	-	T	G	C	G	G	G	A	G	T	T	C	T	C	A	G	A	G	T	T	A	C				
HUM:	T	C	T	C	C	A	T	G	A	G	T	A	C	A	A	A	T	A	A	A	T	T	A	A	C	A	G	T	C	C	C	A	A	G	C	G	A	C	A	C	C	T	T	T	T	C	A	T	G	T				
UAM:	T	C	T	C	C	T	T	G	A	G	T	A	C	A	A	A	T	A	A	A	T	T	A	A	C	A	G	T	T	C	C	A	A	G	C	G	A	C	G	C	C	T	T	T	T	C	A	T	G	T				
HUM:	G	C	A	G	T	C	T	A	C	C	T	T	A	C	A	A	T	G	A	C	C	A	A	C	C	T	G	A	A	A	G	C	C	A	A	G	G	A	C	A	A	G	G	C	-	-	T	G	T	G				
UAM:	G	C	A	G	T	C	T	A	C	C	T	T	A	C	A	A	T	G	A	C	C	A	A	C	C	T	G	A	A	A	G	T	C	A	A	G	G	C	A	A	G	G	C	A	A	G	G	C	C	T	T	G	T	-
HUM:	T	A	-	T	T	A	C	T	G	T	G	A	G	G	G	A																																						
UAM:	T	A	G	-	-	A	C	T	G	T	G	A	G	G	G	A																																						

D7

HUM:	C	A	C	A	G	G	A
UAM:	C	A	C	A	G	G	A

D9

HUM:	A	G	A	C	A	C	A	A	A	A	A
UAM:	A	G	A	C	A	G	A	A	A	A	A

IGHV7-56

GENE ALIGN SEQ

HUM:	A	T	G	G	A	C	T	G	G	A	C	C	T	G	G	A	G	C	A	T	C	C	T	C	T	T	C	T	T	G	G	T	G	G	C	A	G	C	A	G	C	A	A	C	A	G	G	T	A	A
UAM:	A	T	G	G	A	C	T	G	G	A	C	C	T	G	G	A	G	G	A	T	C	C	T	C	T	T	C	T	T	G	G	T	G	G	C	A	G	C	A	G	C	A	A	C	A	G	G	T	A	A
HUM:	G	G	G	A	C	T	C	C	C	A	G	T	C	C	C	A	G	G	G	C	T	G	A	G	G	G	A	G	A	A	A	C	C	A	G	G	C	C	A	G	T	C	A	T	G	T	G	A	G	
UAM:	G	G	G	A	C	T	C	C	C	A	G	T	C	C	C	A	G	G	G	C	T	G	A	G	G	G	A	G	A	A	A	C	C	A	G	G	C	C	A	G	T	C	A	T	G	T	G	A	G	
HUM:	A	C	T	T	C	A	C	C	C	A	C	T	G	C	T	G	T	C	T	C	C	T	C	T	C	C	A	C	A	G	G	T	G	C	C	C	A	C	T	C	C	C	G	A	G	T	G	C	A	G
UAM:	A	C	T	T	C	A	C	C	C	A	C	T	G	C	T	G	T	C	T	C	C	T	C	T	C	C	A	C	A	G	A	T	G	C	C	C	A	C	T	C	C	C	G	A	G	T	G	C	A	G
HUM:	C	T	G	G	T	G	C	A	G	T	C	T	G	G	G	C	C	T	G	A	G	G	T	G	A	A	G	C	A	G	C	C	T	G	G	G	G	C	C	T	C	G	G	C	G	A	A	G	G	T
UAM:	C	T	G	G	T	G	C	A	G	T	C	T	G	G	G	C	C	T	G	A	G	G	T	G	A	A	G	C	A	G	C	C	T	G	G	G	G	A	C	-	C	G	G	T	G	A	A	G	T	T
HUM:	C	T	C	C	T	G	C	A	A	G	G	-	T	G	T	C	T	G	G	T	T	A	A	A	C	T	G	T	C	A	T	C	A	C	C	T	A	T	G	G	T	A	T	G	A	A	T	T	G	G
UAM:	C	T	C	C	T	G	C	A	A	G	G	C	T	-	T	C	T	G	G	T	T	A	A	A	C	T	G	T	C	A	T	C	A	C	C	T	A	T	G	G	T	A	T	G	A	A	T	T	G	G
HUM:	A	T	A	C	G	A	C	A	G	A	C	C	C	C	A	G	G	A	C	A	G	G	G	G	C	T	T	G	A	G	T	G	G	A	T	G	G	A	T	G	G	A	T	C	A	T	C	C	T	
UAM:	A	T	A	T	G	A	C	A	G	A	C	C	C	C	A	G	G	A	C	A	G	G	G	G	C	T	T	G	A	G	T	G	G	A	T	G	G	A	A	T	G	G	A	T	C	A	T	C	C	T
HUM:	A	C	C	C	T	G	G	T	G	A	A	C	C	C	A	A	T	G	T	A	T	G	C	C	C	A	C	A	G	A	T	T	C	A	C	A	C	A	C	G	G	T	T	T	G	T	C	T	T	C
UAM:	A	C	C	C	T	G	G	T	G	A	A	C	C	C	A	A	C	G	T	A	T	G	C	C	C	A	C	A	G	C	T	T	C	A	C	A	C	A	C	G	G	T	T	T	G	T	C	T	T	C
HUM:	T	C	C	A	T	G	G	A	C	A	C	C	T	C	T	G	T	C	A	G	C	A	C	G	G	C	G	G	A	T	C	T	G	C	A	G	A	C	T	A	G	C	T	G	C	C	T	A	A	A
UAM:	T	C	C	A	T	G	G	A	C	A	C	A	T	C	T	G	T	C	A	G	C	A	T	G	G	C	A	G	A	T	C	T	G	C	A	G	A	C	T	A	G	C	T	G	C	C	T	G	A	A
HUM:	G	A	C	T	G	A	G	G	A	T	G	C	A	G	C	C	A	T	T	T	A	T	T	A	C	T	G	T	G	T	G	A	G	G	T	A														
UAM:	G	A	C	T	G	A	G	G	A	T	G	C	A	G	C	C	A	T	T	T	A	T	T	A	C	T	G	T	G	T	G	A	G	G	T	A														

D7

HUM:	C	A	C	C	G	T	G
UAM:	C	A	C	C	G	T	G

D9

HUM:	T	T	T	A	G	A	A	A	C	C	C
UAM:	T	T	T	A	G	A	A	A	C	C	C

IGHV4-55

GENE ALIGN SEQ

HUM:	A	T	G	A	A	A	C	A	C	C	T	G	T	G	G	T	T	C	T	T	C	C	T	G	C	T	G	G	T	G	G	C	A	G	C	T	C	C	C	A	G	A	T	G	T	G	A				
UAM:	A	T	G	A	A	A	C	A	C	C	T	G	T	G	G	T	T	C	T	T	T	G	T	C	C	T	C	C	T	G	G	T	G	G	C	A	G	C	T	C	C	C	A	G	A	T	G	T	G	A	
HUM:	G	T	G	C	C	T	C	A	G	G	G	A	T	C	C	A	G	A	C	C	T	G	A	-	-	-	A	G	A	T	A	T	G	A	G	A	T	G	C	T	G	C	C	T	C	T	C	A	T	C	
UAM:	G	T	G	T	C	T	C	A	G	G	G	A	T	C	C	A	G	A	C	-	-	-	A	T	G	G	A	G	A	T	A	T	G	G	G	A	-	G	G	T	G	C	C	T	C	T	G	A	T	C	
HUM:	C	C	A	G	G	G	C	T	C	A	C	C	G	T	G	G	T	T	C	T	C	T	C	T	G	T	T	C	A	C	A	G	G	G	G	T	C	C	T	G	T	C	C	C	A	G	G	T	G	C	
UAM:	C	C	A	G	G	G	C	T	C	A	C	C	T	G	T	G	G	G	T	C	T	C	T	C	T	G	T	T	C	A	C	A	G	G	G	G	T	C	C	T	G	T	C	C	C	A	G	G	T	G	C
HUM:	A	G	C	T	G	C	A	G	G	A	G	T	C	G	G	G	C	C	C	A	G	G	A	C	T	G	G	T	G	A	A	G	C	C	T	T	C	G	G	A	G	A	C	C	C	T	G	T	C	C	
UAM:	A	G	T	T	G	C	A	G	G	A	G	T	C	G	G	G	C	C	C	A	G	G	A	C	T	G	G	T	G	A	A	G	C	C	T	T	C	G	G	A	G	A	C	C	C	T	G	T	C	C	
HUM:	C	T	C	A	T	C	T	G	C	G	C	T	G	T	C	T	C	T	G	G	T	G	A	C	T	C	C	A	T	C	A	G	C	A	G	T	G	G	T	A	-	-	A	C	T	G	G	T	G	A	
UAM:	C	T	C	A	C	C	T	G	C	G	C	T	G	T	C	T	C	T	G	G	T	G	G	C	T	C	C	A	T	C	A	G	T	A	G	T	-	-	T	A	C	T	A	C	T	G	G	-	-	A	
HUM:	-	-	-	-	-	A	T	C	T	G	G	G	T	C	C	G	C	C	A	G	C	C	C	C	C	A	G	G	G	A	A	G	G	G	G	C	T	G	G	A	G	T	G	G	A	T	T	G	G	G	
UAM:	G	C	T	G	G	A	T	-	-	-	-	-	-	C	C	G	G	C	A	G	C	C	A	C	C	A	G	G	G	A	A	G	G	G	G	C	T	G	G	A	G	T	G	G	A	T	T	G	G	G	
HUM:	G	-	-	A	A	-	-	-	A	-	T	C	C	A	T	C	A	T	A	G	T	G	G	G	A	G	C	A	C	C	T	A	C	T	A	C	A	A	C	C	C	G	T	C	C	C	T	C	A	A	
UAM:	G	G	T	-	A	T	C	T	A	T	T	C	C	-	-	-	-	-	A	G	T	G	G	G	A	G	C	A	C	C	T	A	C	T	A	C	A	A	C	C	C	G	T	C	C	C	T	C	A	A	
HUM:	G	A	G	T	C	G	A	A	T	C	A	C	C	A	T	G	T	C	C	G	T	A	G	A	C	A	C	G	T	C	C	A	A	G	A	A	C	C	A	G	T	T	C	T	A	C	C	T	G	A	
UAM:	G	A	G	T	C	G	A	G	T	C	A	C	C	A	T	A	T	C	A	G	T	A	G	A	C	A	C	G	T	C	C	A	A	G	A	A	C	C	A	G	T	T	C	T	C	C	C	T	G	A	
HUM:	A	G	C	T	G	A	G	C	T	C	T	G	T	G	A	C	C	G	C	C	G	C	G	G	A	C	A	C	G	G	C	C	G	T	G	T	A	T	T	A	C	T	G	T	G	C	G	A	G	A	
UAM:	A	G	C	T	G	A	G	C	T	C	T	G	T	G	A	C	C	G	C	C	G	C	G	G	A	C	A	C	G	G	C	C	G	T	G	T	A	T	T	A	C	T	G	T	G	C	G	A	G	A	
HUM:	T	A																																																	
UAM:	G	A																																																	

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	G	A	C	A	C	A	A	A	C	C	T
UAM:	G	A	C	A	A	A	A	A	C	C	T

IGHV3-54

GENE ALIGN SEQ

HUM:	A	T	G	G	A	G	C	T	T	G	G	G	C	T	G	A	G	C	T	G	G	G	T	T	T	T	C	A	C	T	G	T	T	G	C	T	G	T	T	T	T	A	A	A	A	G	G	T	G	A		
UAM:	A	T	G	G	A	G	T	T	T	G	G	G	C	T	G	A	G	C	T	G	T	G	T	T	T	T	C	A	C	T	G	T	T	G	C	T	G	T	T	T	T	A	A	A	A	G	G	T	G	A		
HUM:	A	C	T	A	G	A	G	A	G	A	T	T	G	A	G	T	G	T	G	A	A	T	G	G	A	T	A	C	A	C	T	T	G	A	G	A	G	A	A	A	C	A	G	T	G	G	A	T	A	T		
UAM:	A	C	T	A	G	A	G	A	G	A	T	T	G	A	G	T	G	T	G	A	A	T	G	G	A	T	A	C	A	C	T	T	G	A	G	A	G	A	A	A	C	A	G	T	G	G	A	T	G	T		
HUM:	G	T	C	T	G	G	A	A	C	T	T	T	C	T	G	A	C	C	A	-	-	-	-	-	-	-	G	G	A	C	A	C	-	-	-	-	-	-	-	C	T	A	C	A	A	G	T	T	T	G	C	A
UAM:	G	T	C	A	G	G	-	-	-	-	-	-	-	-	-	-	-	-	C	A	G	T	T	T	T	G	G	A	C	-	C	G	G	G	A	T	G	T	C	T	A	C	A	T	G	T	T	T	G	C	A	
HUM:	G	G	T	G	T	C	C	A	G	T	G	T	G	A	G	G	T	A	C	A	G	C	T	G	G	T	G	G	A	G	T	C	T	G	A	A	G	A	A	A	C	C	A	A	A	G	A	C	A			
UAM:	G	G	T	G	T	C	C	A	G	T	G	T	G	A	G	G	T	A	C	A	G	C	T	G	G	T	G	G	A	G	T	C	T	G	A	A	G	A	G	A	C	C	C	A	A	G	A	C	A			
HUM:	A	C	T	T	G	G	G	G	G	-	-	A	T	C	C	C	T	G	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	A	C	T	C	T	G	G	A	T	T	A	A	C	C	T	T		
UAM:	A	C	C	T	G	G	G	G	G	G	-	T	C	G	C	T	G	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	G	A	T	T	A	A	C	C	T	T			
HUM:	C	A	G	T	A	G	C	T	A	C	T	G	A	A	T	G	A	G	C	T	C	A	G	-	-	A	T	T	C	C	C	A	G	G	C	T	C	C	A	G	G	A	A	G	G	G	G	C	T			
UAM:	C	A	G	T	A	G	C	T	A	C	T	G	A	A	T	G	A	G	C	T	C	-	G	G	T	-	T	T	C	C	C	A	G	G	C	T	C	C	A	G	G	A	A	G	G	G	G	C	T			
HUM:	G	G	A	G	T	G	A	G	T	A	G	T	A	G	A	T	A	T	A	T	A	G	T	A	G	G	A	T	A	G	A	A	G	T	C	A	G	C	T	A	T	G	T	T	A	T	G	C	A	C		
UAM:	G	G	A	G	T	G	A	G	T	A	G	T	A	G	A	T	A	A	A	T	A	G	T	A	C	G	A	T	A	G	A	A	G	T	C	A	G	A	T	A	T	G	T	T	A	T	G	C	A	C		
HUM:	A	A	T	C	T	G	T	G	A	A	G	A	G	C	A	G	A	T	T	C	A	C	C	A	T	C	T	C	C	A	A	A	G	A	A	A	A	T	G	C	C	A	A	G	A	A	C	T	C	A		
UAM:	A	A	T	C	T	G	T	G	A	A	G	A	G	C	A	G	A	T	T	C	A	C	C	A	T	C	T	C	C	A	A	A	G	A	A	A	A	T	G	C	C	A	A	G	A	A	C	T	C	A		
HUM:	C	T	C	T	G	-	-	T	T	T	G	C	A	A	A	T	G	A	A	C	A	G	T	C	T	G	A	G	A	G	C	A	G	A	G	G	G	C	A	C	G	G	C	C	G	T	G	T	A	T		
UAM:	C	T	-	-	G	T	A	T	T	T	G	C	A	A	A	T	G	A	A	C	A	G	T	C	T	G	A	G	A	G	C	A	G	A	G	G	G	C	A	C	C	G	C	C	G	T	G	T	A	T		
HUM:	T	A	C	T	G	T	A	T	G	T	G	A	G	T	C	A																																				
UAM:	T	A	C	T	G	T	A	T	G	T	G	A	G	G	C	A																																				

D7

HUM:	C	C	A	G	G	T	A
UAM:	C	C	A	G	G	T	A

D9

HUM:	G	A	C	A	C	A	G	A	A	T	T
UAM:	G	G	T	A	C	A	G	A	A	T	T

IGHVII-53-1

GENE ALIGN SEQ

HUM: G G C C T G G T G A A G C C C T C A C A G A C C C T C T C C C T C A C C T G T G C T G T C T C T G G
UAM: G G C C T G G T G A A G C C C T C A C A G A C C C T C T C C A T T A C C T G T G C C G T C T C T G G

HUM: A T T C C C C A T C A C A A C C A G T G C T T C C T G C T G T A G C T G C A T T C A T A A A C C C C
UAM: A T T C C C C A T C A C A A C C A G T G T T T C C T G C T G G A G C T G C A - T C A T A A A T C C C

HUM: C C A G G A A G G G A C T G G A G T G A A T C C A G T G C A C A G G T C A T G A G G G A G T G C A C
UAM: C C A G G A A G G G A C T G G A G T G A A T C C A C T G C A C A G G T C A T G A G G G A G T G C A C

HUM: A T T C C A A C C C A C T C C T C A A G A G T C C A G T C A C C A T C T C C A G A T C C A T G T C C
UAM: A T T C C A A C C T A C T C C T C A A G A G T C C A G T C A C C A T C T C C A G A T C C A T G T C C

HUM: A A A A A G C A G T T C T T C C T A C A G C C G A G C T A A G T G A G T C A C A A G C A C A C A G C
UAM: A A A A A G C A G T T C T T C C T A C A G C T G A G C T A A G T G A G T C G C A A G C A C A T A G C

HUM: C A T G T A T T T T T A A C A A A A G A
UAM: C A T G T A T T T T T A A C A A A A G A

D7

HUM: C A C A G T A
UAM: C A C A G T G

D9

HUM: C A C C C A A A C C T
UAM: C A T C C A A A C C T

IGHV3-53

GENE ALIGN SEQ

HUM:	A	T	G	G	A	G	T	T	T	T	G	G	C	T	G	A	G	C	T	G	G	G	T	T	T	T	C	C	T	G	T	T	G	C	T	A	T	T	T	T	A	A	A	A	G	G	T	G	A	
UAM:	A	T	G	G	A	G	T	T	T	G	G	G	C	T	G	A	G	C	T	G	G	G	T	T	T	T	C	C	T	T	G	T	T	G	C	T	A	T	T	T	T	A	A	A	A	G	G	T	G	A
HUM:	T	T	C	A	T	G	G	A	G	A	A	C	T	A	G	A	G	A	T	A	T	T	G	-	A	G	T	G	T	G	A	G	T	G	A	A	C	A	C	G	A	G	T	G	A	G	A	G	A	A
UAM:	T	T	C	A	T	G	G	A	G	A	A	C	T	A	G	A	C	A	T	A	T	T	G	G	-	-	-	-	G	A	A	T	C	A	A	C	A	T	G	A	G	T	G	A	G	A	G	A	A	
HUM:	A	C	A	G	T	G	G	A	T	-	-	-	-	-	-	-	-	-	A	T	G	T	G	T	G	G	C	A	G	T	T	T	C	T	A	A	C	C	A	A	T	G	T	C	T	C	T	G	T	G
UAM:	A	C	A	G	T	G	G	A	T	T	T	G	T	G	T	G	G	C	-	-	G	T	G	T	G	G	C	A	G	T	T	T	C	T	A	A	C	C	A	A	T	G	T	C	T	C	T	G	T	G
HUM:	T	T	T	G	C	A	G	G	T	G	T	C	C	A	G	T	G	T	G	A	G	G	T	G	C	A	G	C	T	G	G	T	G	G	A	G	T	C	T	G	G	A	G	G	A	G	G	C	T	T
UAM:	T	T	T	G	C	A	G	G	T	G	T	C	C	A	G	T	G	T	G	A	G	G	T	G	C	A	G	C	T	G	G	T	G	G	A	G	T	C	T	G	G	A	G	G	A	G	G	C	T	T
HUM:	G	A	T	C	C	A	G	C	C	T	G	G	G	G	G	G	T	C	C	C	T	G	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	G	G	T	T	C	A
UAM:	G	G	T	A	C	A	G	C	C	T	G	G	G	G	G	G	T	C	C	C	T	G	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	G	A	T	T	C	A
HUM:	C	C	G	T	C	A	G	T	A	G	C	-	A	A	C	T	A	-	C	A	T	G	A	G	C	T	G	G	G	T	C	C	G	C	C	A	G	G	C	T	C	C	A	G	G	G	A	A	G	G
UAM:	C	C	G	T	C	A	G	T	A	G	C	T	-	-	C	T	A	G	C	A	T	G	A	T	C	T	G	G	G	T	C	T	G	C	C	A	G	G	C	T	C	C	A	G	G	G	A	A	G	G
HUM:	G	G	C	T	G	G	A	G	T	G	G	G	T	C	T	C	A	G	T	T	-	-	A	T	T	T	A	-	T	A	G	-	C	G	G	-	T	G	G	T	A	G	C	A	C	A	T	A	C	T
UAM:	G	G	C	T	G	G	A	G	T	G	G	G	T	C	T	C	A	-	-	T	A	C	A	T	T	-	A	G	T	A	G	T	-	-	G	A	T	G	G	T	A	G	C	G	C	A	T	A	C	T
HUM:	A	C	G	C	A	G	A	C	T	C	C	G	T	G	A	A	G	G	G	C	C	G	A	T	T	C	A	C	C	A	T	C	T	C	C	A	G	A	G	A	C	A	A	T	T	C	C	A	A	G
UAM:	A	C	G	C	A	G	A	C	T	C	C	G	T	G	A	A	G	G	G	T	A	G	A	T	T	C	A	C	C	G	T	C	T	C	C	A	G	A	G	A	C	A	A	T	T	C	C	A	A	G
HUM:	A	A	C	A	C	G	C	T	G	T	A	T	C	T	T	C	A	A	A	T	G	A	A	C	A	G	C	C	T	G	A	G	A	G	C	C	G	A	G	G	A	C	A	C	G	G	C	C	G	T
UAM:	A	A	C	A	C	G	C	T	G	T	A	T	C	T	T	C	A	A	A	T	G	A	A	C	A	G	C	C	T	G	A	G	A	G	C	T	G	A	G	G	A	C	A	C	G	G	C	T	G	T
HUM:	G	T	A	T	T	A	C	T	G	T	G	C	G	A	G	A	G	A																																
UAM:	G	T	A	-	T	A	C	T	G	T	G	C	G	A	A	A	G	A																																

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	G	G

D9

HUM:	G	A	C	A	C	A	A	A	C	C	T
UAM:	G	A	C	A	C	A	A	A	C	C	T

IGHV3-52

GENE ALIGN SEQ

HUM: A T G G A G T C T G G G C T G A G C T G G G T T T T C C T T G T T G C T A T T T T G A A A G G T G A
UAM: A T G G A G T C T G G G C T G A G C C G G G T T T T C C C T G T T G C T A C T T T G A A A G G T G A

HUM: T T C A T G G G A A T G A G T T G A A T G T A A G T G A A T A T G A G T G A G A G A A A C A G T G
UAM: T T C A T G G G A A T G A G T T G A A T G T A A G T G A A T A T G A G T G A G A G A A A C T G T G

HUM: - - - G A T G T G T G C G G C A G T T T C T G A C C A G G G T G T C T C T G T G T T T G C A G G T G
UAM: A A C - A T G T G T - - G G C A G T T T C T G A C C A G G A T G T C T C T G T G T T T G C A G G T G

HUM: T C C A G T G T G A G G T G C A G C T G G T G G A G T C T G G G T G A G G C T T G G T A C A G C C T
UAM: T C C A G T G T G A G G T G C A G C T G G T G G A G T C T G G G T G A G G C T T G G T A C A G C C T

HUM: G G A G G G T C C C T G A G A C T C T C C T G T G C A G C C T C T G G A T T C A C C T T C A G T A G
UAM: G G A G G G T C C C T G A G A C T C T C C T T T T G C A G C C T C T G G A T T C A C C T T C A G T A G

HUM: C T C C T G G A T G C A C T G G G T C T G C C A G G C T C C G G A G A A G G G G C T G G A G T G G G
UAM: C T C C T G G A T G C A C T G G G T C T G C C A G G C T C C A G A G A A G G G G C T G G A G A G G G

HUM: T G G C C G A C A T A A A G T G T G A C G G A A G T G A G A A A T A C T A T G T A G A C T C T G T G
UAM: T G G C C A A C A T A A A G T G T G A T G G A A G T G A G A A A T A C T A T G C A G A C T C T G T G

HUM: A A G G G C C G A T T G A C C A T C T C C A G A G A C A A T G C C A A G A A C T C C C T C T A T C T
UAM: A A G G G C C G A T T G A C C A T C T C C A G A G A C A A T G C C A A G A A C T C T C T C T A T C T

HUM: G C A A G T G A A C A G C C T G A G A G C T G A G G A C A T G A C C G T G T A T T A C T G T G T G A
UAM: G C A A A T G A A C A G C C T G A G A G C T G A G G A C A T G G C C G T G T A T T A C T G T G T G A

HUM: G A G G
UAM: G A G A

D7
HUM: C A C A G T G
UAM: C A C A G T G

D9
HUM: G A C A C A A A C C T
UAM: G A C A C A A A C C T

IGHVII-51-2

GENE ALIGN SEQ

HUM: G G C C T G G T G A G G C C C T C A C - A G A C C C C C T C C C T C A C C T G T G C T G T C T C T G
UAM: G G C C T G G T G A G G C C C T C - C G A G A C C C C C T C C C T C A C C T G T G C T G T C T C T G

HUM: G A T T C T C C A T C A C A A C T A G T G C T T C C T G C T G G A G C T G G A T C C G C C A G T C C
UAM: G A T T C T C C A T C A C A A C C A G C G C T T C C T G C T G G A G C T G G A T C C G C C A G T C C

HUM: T C A G T C A A G G G A G T G G A T C A G G G C A T A G G T C A C G A G G G A G C A C A A A T T C T
UAM: T C A G T C A A G G A A G T G G A T C A G G G C A T A G G T A A C G A G G G A G C A C A A A T T C T

HUM: A A C C C A C T C C T C A T G A G C T C A G T C A C C A T C T C C A G A T C C A C G T C C A A G A A
UAM: A A C C C A C T C C T C A T G A G C T C A G T C A C C A T C T C C A G A T C C A A G A A

HUM: C C A A A T T T T C T T T T A G C T G A G T T C T G T G A C C A A C A A T G C C A C A A C C T T G T
UAM: C C A A A T T T T C T T T T A G C T G A G T T C T G T G A C C A A C A A C G C C A C A A C C T T G T

HUM: A T T A C T G T G A G A G G
UAM: A T T A C T G T G A G A G G

D7
HUM: A A C A G A A
UAM: A A C A G A G

D9
HUM: C A C A A A C T T C C
UAM: C A C A A A C T T C C

IGHV8-51-1

GENE ALIGN SEQ

HUM:	G	T	A	T	C	C	A	G	G	G	T	G	A	G	G	C	C	C	A	G	C	T	T	A	C	A	G	A	G	T	C	T	G	G	G	G	A	G	A	C	T	T	G	G	T	A	C	A	C
UAM:	G	T	G	T	C	C	A	G	G	G	T	G	A	G	G	C	C	C	A	G	C	T	T	A	C	A	G	A	G	T	C	T	G	G	G	G	A	G	A	C	T	T	G	G	T	A	C	A	C

HUM:	T	G	A	G	A	G	G	G	G	C	C	C	C	T	G	A	G	G	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	T	G	G	T	T	C	A	C	C	T	T	C	A	G
UAM:	T	T	A	G	A	G	G	G	G	C	C	C	C	T	G	A	G	G	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	T	G	G	T	T	C	A	C	C	T	T	C	A	G

HUM:	T	A	T	C	T	A	T	G	A	G	A	T	T	C	A	C	T	G	G	G	T	T	T	G	C	C	A	G	G	C	C	T	C	A	G	G	G	A	A	G	G	G	G	C	T	G	G	A	A	T
UAM:	T	A	T	C	T	A	C	G	A	G	A	T	T	C	A	C	T	G	G	G	T	T	T	G	C	C	A	G	G	C	C	T	C	A	G	G	G	A	A	G	G	A	G	C	T	G	G	A	A	T

HUM:	G	G	G	T	T	G	C	A	G	T	T	A	T	A	T	G	G	C	G	T	G	G	T	G	A	A	A	G	T	C	A	T	C	A	A	T	A	C	A	A	T	G	C	A	G	A	C	T	A	T
UAM:	G	G	G	T	T	T	C	A	G	T	T	A	T	A	T	-	-	-	G	T	G	G	T	G	A	A	A	G	T	C	A	T	C	A	A	T	A	C	A	A	T	G	C	A	G	A	C	T	A	T

HUM:	G	T	T	A	G	G	G	G	C	A	G	A	C	T	C	A	C	C	A	C	T	T	C	C	A	G	A	G	A	C	A	A	C	A	C	C	A	A	G	T	A	C	A	T	G	C	T	G	T	A
UAM:	G	T	T	A	G	G	G	G	C	A	G	A	C	T	C	A	C	G	A	T	T	T	C	C	A	G	A	G	A	C	A	G	C	A	C	C	A	A	G	T	A	C	A	T	G	C	T	G	T	A

HUM:	C	A	T	G	C	A	A	A	T	G	A	A	C	A	G	C	C	T	G	A	G	A	A	C	C	C	A	G	A	A	C	A	T	G	G	C	A	G	C	A	T	T	T	A	A	C	T	G	T	G
UAM:	C	A	T	G	C	A	A	A	T	G	A	A	C	A	G	C	C	T	G	A	G	A	A	C	C	C	A	G	A	A	C	A	C	G	G	C	A	G	C	A	T	T	T	A	A	C	T	G	T	G

HUM:	C	A	G	G	A	A	A
UAM:	C	A	G	G	A	A	A

HUM:	C	A	T	C	G	T	G
UAM:	C	A	T	C	G	T	G

HUM:	G	A	G	A	C	A	G	A	C	T	G
UAM:	G	A	G	A	C	A	G	A	C	C	G

IGHV5-51

GENE ALIGN SEQ

HUM:	A	T	G	G	G	G	T	C	A	A	C	C	G	C	C	A	T	C	C	T	C	G	C	C	C	T	C	C	T	G	G	C	T	G	T	T	C	T	C	C	A	A	G	G	T	C	A			
UAM:	A	T	G	G	A	G	T	C	A	A	C	C	G	C	C	A	T	C	C	T	C	G	T	C	C	T	C	C	T	G	G	C	T	G	T	T	C	T	C	C	A	A	G	G	T	C	A			
HUM:	G	T	C	C	T	G	C	C	G	A	G	G	G	C	-	-	-	-	-	T	T	G	A	G	G	T	C	A	C	A	G	A	G	G	A	G	A	A	C	G	G	G	T	G	-	-	-	-	G	A
UAM:	G	T	C	C	T	G	C	C	-	-	-	-	-	C	A	G	G	G	G	T	T	G	A	G	G	T	C	A	C	A	G	A	A	A	A	G	A	A	-	-	-	-	T	G	G	G	A	G	A	
HUM:	A	A	G	G	A	G	C	C	C	C	T	G	A	T	T	C	A	A	A	T	T	T	T	G	T	G	T	C	T	C	C	C	C	A	C	A	G	G	A	G	T	C	T	G	T	G	C	C	G	
UAM:	A	A	G	G	A	G	C	C	C	C	T	G	A	T	T	C	A	A	A	T	T	T	T	G	T	A	T	C	T	C	C	C	C	T	A	C	A	G	G	A	G	T	C	T	G	T	G	C	C	G
HUM:	A	G	G	T	G	C	A	G	C	T	G	G	T	G	C	A	G	T	C	T	G	G	A	G	C	A	G	A	G	G	T	G	A	A	A	A	A	G	C	C	C	G	G	G	G	A	G	T	C	T
UAM:	A	G	G	T	G	C	A	G	C	T	G	G	T	G	C	A	G	T	C	T	G	G	A	G	C	A	G	A	G	G	T	G	A	A	A	A	G	G	C	C	C	G	G	G	G	A	G	T	C	T
HUM:	C	T	G	A	A	G	A	T	C	T	C	C	T	G	T	A	A	G	G	G	T	T	C	T	G	G	A	T	A	C	A	G	C	T	T	T	A	C	C	A	G	C	T	A	C	T	G	G	A	T
UAM:	C	T	G	A	G	A	T	C	T	C	C	T	G	T	A	A	G	A	C	T	T	C	T	G	G	A	T	A	C	A	G	C	T	T	T	A	C	C	A	G	C	T	A	C	T	G	G	A	T	
HUM:	C	G	G	C	T	G	G	G	T	G	C	G	C	C	A	G	A	T	G	C	C	C	G	G	G	A	A	A	G	G	C	C	T	G	G	A	G	T	G	G	A	T	G	G	G	G	A	T	C	A
UAM:	C	A	G	C	T	G	G	G	T	G	C	G	C	C	A	G	A	T	G	C	C	C	G	G	G	A	A	A	G	G	C	C	T	G	G	A	G	T	G	G	A	T	G	G	G	G	A	G	C	A
HUM:	T	C	T	A	T	C	C	T	G	G	T	G	A	C	T	C	T	G	A	T	A	C	C	A	G	A	T	A	C	A	G	C	C	C	G	T	C	C	T	T	C	C	A	A	G	G	C	C	A	G
UAM:	T	C	T	A	T	C	C	T	G	G	T	G	A	C	T	C	T	G	A	T	A	C	C	A	G	A	T	A	C	A	G	C	C	C	A	T	C	C	T	T	C	C	A	A	G	G	C	C	A	C
HUM:	G	T	C	A	C	C	A	T	C	T	C	A	G	C	C	G	A	C	A	A	G	T	C	C	A	T	C	A	G	C	A	C	C	G	C	C	T	A	C	C	T	G	C	A	G	T	G	G	A	G
UAM:	G	T	C	A	C	C	A	T	C	T	C	A	G	C	C	G	A	C	A	A	G	T	C	C	A	T	C	A	G	C	A	C	C	A	C	C	T	A	C	C	T	G	C	A	G	T	G	G	A	G
HUM:	C	A	G	C	C	T	G	A	A	G	G	C	C	T	C	G	G	A	C	A	C	C	G	C	C	A	T	G	T	A	T	T	A	C	T	G	T	G	C	-	-	-	G	A	G	A	C	A		
UAM:	C	A	G	C	C	T	G	A	A	G	G	C	C	T	C	G	G	A	C	A	C	C	G	C	C	A	T	G	T	A	T	T	A	C	T	G	T	G	C	A	A	A	-	A	G	-	-	A		

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	T	C	T	A	A	A	A	C	C	C	T
UAM:	T	C	T	A	A	A	A	C	C	C	T

IGHV3-50

GENE ALIGN SEQ

HUM:	A	T	A	G	A	G	T	T	A	G	G	G	C	T	G	A	G	C	T	G	G	G	T	T	T	C	C	C	T	T	G	T	C	A	T	T	A	T	T	T	T	A	A	A	A	G	G	C	G	A		
UAM:	G	T	A	G	A	G	T	T	A	G	G	G	C	T	G	A	G	C	T	G	G	G	T	T	T	C	T	C	T	T	G	T	C	A	C	T	A	T	T	T	T	A	A	A	A	G	G	T	G	A		
HUM:	A	T	A	A	T	G	G	A	G	A	A	C	T	T	G	A	G	A	T	A	T	G	G	A	G	T	G	G	A	T	A	T	G	A	G	T	G	-	A	A	A	A	A	A	A	A	A					
UAM:	A	T	A	A	T	G	G	A	G	A	A	C	T	T	G	A	G	A	T	A	T	T	G	A	G	T	G	T	G	A	G	T	G	G	A	T	A	T	G	A	G	T	G	A	A	A	A	A	A	A		
HUM:	C	A	G	T	G	A	T	T	C	T	G	T	G	T	G	G	C	A	G	G	T	T	C	T	G	A	C	T	C	A	G	A	T	G	T	C	T	C	T	G	T	G	C	T	T	G	T	A	G	C		
UAM:	C	A	G	T	G	A	T	T	C	T	G	T	G	T	G	G	C	A	G	G	T	T	C	T	G	A	C	T	C	A	A	A	T	G	T	C	T	C	T	G	T	G	T	T	T	G	T	A	G	C		
HUM:	T	G	T	C	T	A	G	T	G	T	G	G	G	G	T	G	C	A	G	A	T	G	G	T	G	G	A	G	T	C	T	T	G	G	G	G	A	G	A	G	T	T	G	G	C	A	C	A	A	G		
UAM:	T	G	T	C	T	A	G	T	G	T	G	A	G	G	T	G	C	A	G	G	T	G	G	T	G	G	A	G	T	C	T	T	G	G	G	G	A	G	A	G	T	T	G	G	C	A	C	A	A	G		
HUM:	C	T	G	A	A	T	G	T	G	C	C	T	G	A	G	A	C	T	C	T	G	C	C	G	T	G	C	A	T	C	C	T	C	T	G	A	A	T	C	C	A	C	C	T	T	C	T	G	T	A		
UAM:	C	T	G	G	A	T	G	T	G	C	C	T	G	A	G	A	C	T	C	T	G	C	T	G	T	G	C	A	G	C	C	T	C	T	G	A	A	T	C	C	A	C	C	T	T	C	C	G	T	A		
HUM:	G	C	T	A	C	T	A	G	A	T	C	A	G	C	T	G	A	A	T	C	T	G	C	C	A	G	G	C	T	C	C	A	G	G	A	A	A	G	G	G	G	C	T	G	C	A	G	T	G	A		
UAM:	G	C	T	A	C	T	A	G	A	T	C	A	G	C	T	G	A	A	C	C	T	G	C	C	A	G	G	C	T	T	C	A	G	G	G	A	A	G	G	G	G	C	T	G	C	A	G	T	G	A		
HUM:	G	T	A	G	T	A	G	A	T	A	T	A	A	T	G	T	A	C	G	A	T	G	G	A	A	G	T	C	A	G	A	C	A	T	A	A	T	A	T	G	C	A	G	A	C	T	C	T	G	T		
UAM:	A	T	A	G	T	A	G	A	T	A	T	A	A	T	G	T	A	C	G	G	T	G	G	A	A	G	T	C	A	G	A	C	A	A	A	A	T	A	T	G	C	A	G	A	C	T	C	T	G	T		
HUM:	G	A	A	G	G	T	C	A	G	A	T	T	C	A	C	C	A	T	C	T	C	C	A	A	A	G	A	C	A	A	T	G	C	C	A	A	G	C	A	C	A	G	G	T	T	G	T	A	T	C		
UAM:	G	A	A	G	G	T	C	A	G	A	T	T	C	A	C	C	A	T	C	T	C	C	A	A	A	G	A	C	A	A	T	G	C	C	A	A	G	C	A	C	A	C	A	C	G	T	T	G	T	A	T	C
HUM:	T	G	C	A	A	A	T	G	A	A	C	A	G	T	C	T	G	A	G	A	G	C	T	G	A	G	A	A	T	A	T	G	G	C	T	C	T	G	T	A	T	T	A	T	T	G	A	G	T	C		
UAM:	T	G	C	A	A	A	T	G	A	A	C	A	G	T	C	T	G	A	G	A	G	C	T	G	A	G	A	A	T	A	T	G	G	C	T	C	T	G	T	A	T	T	A	T	T	G	A	G	A	C		
HUM:	A	A	A	G	G	T	A																																													
UAM:	A	A	A	G	G	T	A																																													
D7																																																				
HUM:	C	C	A	A	A	T	G																																													
UAM:	C	C	A	A	A	T	G																																													
D9																																																				
HUM:	G	A	C	A	C	A	A	A	A	T	T																																									
UAM:	G	A	C	A	C	A	A	A	A	T	T																																									

IGHVII-49-1

GENE ALIGN SEQ

HUM: G G C C T G G C G A A G C C C T C A C A G A C C C T C T C C C T C A T C T G T G C T G T C T C T G C
UAM: G G C C T G G C G A A G C C C T C A C A G A C C C T C T C C C C C A T C T G T G C T G T C T C T G C

HUM: - T T C T C C A T C A C A A C C A G T G C T T C C T G C T G G A G C T G G A T C C C T C A G C T C C
UAM: A T T C T C C A T T T C A A A C A G T G C T T C C T G C T G G A G C T G G A T C C A T C A G C T C C

HUM: C C A G G G A A G G G A C T G G A G T G A A T C A G G T G C A C A G G T C A T G A G G G A G A A C A
UAM: C C A G G G A A G G G A C T G G A G C G A A T C A G G T G C A C A G G T C A T G A G G G A G A G C A

HUM: C A A C G C A A C C C A C G C C T C A A G A G T C C A G T C A C C A T C T C C A G A T C C A C A T C
UAM: C A A C G C A A C C C A C T C C T C A A G A G T C C A G T C A C C A T C T C C A G A T C C A C A C C

HUM: C A A A A C A C A G - - T T T C - T T C T A C A G C T G A G C T A C C T G A G C A A C G A G T A C A
UAM: C A A A A A A C T G T T T T T C G - - - T A C A G C T G A G C T A C C T G A G C A A C G A G T A C A

HUM: C A A C C A T G A A T T T T T A C A C A A A A G A
UAM: C A A C C A T G A A T T T T T A C A C A A A A G A

D7

HUM: T A C A G C A
UAM: T A C A G C G

D9

HUM: G A A A C A A A C C T
UAM: G A A A C A A A T C C

IGHV3-49

GENE ALIGN SEQ

HUM:	A	T	G	G	A	G	T	T	T	G	G	G	C	T	T	A	G	C	T	G	G	G	T	T	T	T	C	C	T	T	G	T	T	G	C	T	A	T	T	T	T	A	A	A	A	G	G	T	A	A
UAM:	A	T	G	G	A	G	T	T	T	G	G	G	C	T	G	A	G	C	T	G	G	G	T	T	T	T	C	C	T	T	G	T	T	G	C	T	A	T	T	T	T	A	A	A	A	G	G	T	A	A
HUM:	T	T	C	A	T	G	G	T	G	T	A	C	T	A	G	A	G	A	T	A	C	T	G	A	G	T	G	T	G	A	G	G	G	G	A	C	A	T	G	A	G	T	G	G	T	A	G	A	A	A
UAM:	T	T	C	A	T	G	G	T	G	T	A	C	T	A	G	A	G	A	T	A	C	T	G	A	G	T	G	T	G	A	G	G	G	G	A	C	A	T	G	A	G	T	G	G	T	A	A	A	A	A
HUM:	C	A	G	T	G	G	A	T	A	T	G	T	G	T	G	G	C	A	G	T	T	T	C	T	G	A	C	C	T	T	G	G	T	G	T	T	T	C	T	G	T	G	T	T	T	G	C	A	G	G
UAM:	C	A	G	T	G	G	A	T	A	T	G	T	G	T	G	G	C	A	G	T	T	T	C	T	G	A	C	C	T	T	G	G	T	G	T	C	T	C	T	G	T	G	T	T	T	G	C	A	G	G
HUM:	T	G	T	C	C	A	A	T	G	T	G	A	G	G	T	G	C	A	G	C	T	G	G	T	G	G	A	G	T	C	T	G	G	G	G	A	G	G	C	T	T	G	G	T	A	A	A	G	C	
UAM:	T	G	T	C	C	A	A	T	G	T	G	A	G	G	T	G	C	A	G	C	T	G	G	T	G	G	A	G	T	C	T	G	G	G	G	A	G	G	C	T	T	G	G	T	C	C	A	C	C	
HUM:	C	A	G	G	G	C	G	G	T	C	C	C	T	G	A	G	A	C	T	C	T	C	C	T	G	T	A	C	A	G	C	T	T	C	T	G	G	A	T	T	C	A	C	C	T	T	T	G	G	T
UAM:	C	A	G	G	G	G	G	T	C	C	C	T	G	A	G	A	A	C	T	C	T	C	C	T	G	T	A	C	A	G	C	T	T	C	T	G	G	A	T	T	C	A	C	C	T	T	T	G	G	T
HUM:	G	A	T	T	A	T	G	C	T	A	T	G	A	G	C	T	G	G	T	T	C	C	G	C	C	A	G	G	C	T	C	C	A	G	G	A	A	G	G	G	G	C	T	G	G	A	G	T	G	
UAM:	G	A	T	T	A	T	G	C	C	A	T	G	A	G	G	T	G	G	G	T	C	C	G	C	C	A	G	G	C	T	C	C	A	G	G	A	A	G	G	G	G	C	T	G	G	A	G	T	G	
HUM:	G	G	T	A	G	G	T	T	T	C	A	T	T	A	G	A	A	G	C	A	A	A	G	C	T	T	A	T	G	G	T	G	G	G	A	C	A	A	C	A	G	A	A	T	A	C	G	C	C	G
UAM:	G	G	T	A	G	G	T	T	T	C	A	T	T	A	G	A	A	G	C	A	A	A	G	C	T	T	A	T	G	G	T	G	G	G	A	C	A	A	C	A	G	A	A	T	A	C	G	C	T	G
HUM:	C	G	T	C	T	G	T	G	A	A	A	G	G	C	A	G	A	T	T	C	A	C	C	A	T	C	T	C	A	A	G	A	G	A	T	G	A	T	T	C	C	A	A	A	A	G	C	A	T	C
UAM:	C	G	T	C	T	G	T	G	A	A	A	G	G	C	A	G	A	T	T	C	A	C	C	A	T	C	T	C	A	A	G	A	G	A	T	G	A	T	T	C	C	A	A	A	A	G	C	A	T	C
HUM:	G	C	C	T	A	T	C	T	G	C	A	A	A	T	G	A	A	C	A	G	C	C	T	G	A	A	A	A	C	C	G	A	G	G	A	C	A	C	A	G	C	C	G	T	G	T	A	T	T	A
UAM:	G	C	C	T	A	T	C	T	G	C	A	A	A	T	G	A	A	C	A	G	C	C	T	G	A	A	A	A	C	C	G	A	G	G	A	C	A	C	G	G	C	C	G	T	G	T	A	T	T	A
HUM:	C	T	G	T	A	C	T	A	G	A	G	A																																						
UAM:	C	T	G	T	G	C	T	A	G	A	G	A																																						

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	G	A	C	A	C	A	A	A	C	C	T
UAM:	G	A	C	A	C	A	A	A	C	C	T

IGHV3-48

GENE ALIGN SEQ

HUM:	A	T	G	G	A	G	T	T	G	G	G	G	C	T	G	T	G	C	T	G	G	G	T	T	T	T	C	C	T	T	G	T	T	G	C	T	A	T	T	T	T	A	G	A	A	G	G	T	G	A
UAM:	A	T	G	G	A	G	T	T	G	G	G	G	C	T	G	A	G	C	T	G	G	G	T	T	T	T	A	C	T	T	G	T	T	G	C	T	A	T	T	T	T	A	G	A	A	G	G	T	G	A
HUM:	T	T	C	A	T	G	G	A	A	A	A	C	T	A	G	A	G	A	G	A	T	T	T	A	G	T	G	T	G	T	G	T	G	G	A	T	A	T	G	A	G	T	G	A	G	A	A	A		
UAM:	T	T	C	A	T	G	G	A	A	A	A	C	T	A	G	A	G	A	G	A	T	T	T	A	G	T	G	T	G	T	G	T	G	G	A	C	A	T	G	A	G	T	G	A	G	A	G	A	A	A
HUM:	C	A	G	T	G	G	A	T	A	T	G	T	G	T	G	G	C	A	G	T	T	T	C	T	G	A	C	C	T	T	G	G	T	G	T	C	T	C	T	T	T	G	T	T	T	G	C	A	G	G
UAM:	C	A	G	T	G	G	A	T	A	T	G	T	G	T	G	G	C	A	C	T	T	T	C	T	G	A	C	C	T	T	G	G	T	G	T	C	T	C	T	T	T	G	T	T	T	G	C	A	G	G
HUM:	T	G	T	C	C	A	G	T	G	T	G	A	G	G	T	G	C	A	G	C	T	G	G	T	G	G	A	G	T	C	T	G	G	G	G	A	G	G	C	T	T	G	G	T	A	C	A	G	C	
UAM:	T	G	T	C	C	A	G	T	G	T	G	A	G	G	T	G	C	A	G	C	T	G	G	T	G	G	A	G	T	C	T	G	G	A	G	G	A	G	G	C	T	T	G	G	T	A	C	A	G	C
HUM:	C	T	G	G	G	G	G	T	C	C	C	T	G	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	G	A	T	T	C	A	C	C	T	T	C	A	G	T	
UAM:	C	T	G	G	G	G	G	T	C	C	C	T	G	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	A	A	T	T	C	A	C	C	T	T	C	A	G	T	
HUM:	A	G	-	C	T	A	T	A	G	C	A	T	G	A	A	-	-	-	-	-	-	-	-	-	-	C	T	G	G	G	T	C	C	G	C	C	A	G	G	C	T	C	C	A	G	G	A	A	G	G
UAM:	A	G	T	-	-	-	-	-	-	-	-	-	-	-	A	A	T	G	A	C	A	T	G	A	G	C	T	G	G	G	T	C	C	A	C	C	A	G	G	C	T	C	C	A	G	G	A	A	G	G
HUM:	G	G	C	T	G	G	A	G	T	G	G	G	T	T	T	C	A	T	A	C	A	T	T	A	G	T	A	G	T	A	-	G	T	A	G	-	-	-	T	A	G	T	A	C	C	A	T	A	T	A
UAM:	G	A	C	T	G	G	A	G	T	G	G	G	T	C	T	C	A	T	A	C	A	T	T	A	G	T	A	-	-	A	C	-	-	A	G	T	G	G	T	A	G	A	A	C	C	A	C	A	T	A
HUM:	C	T	A	C	G	C	A	G	A	C	T	C	T	G	T	G	A	A	G	G	G	C	C	G	A	T	T	C	A	C	C	A	T	C	T	C	C	A	G	A	G	A	C	A	A	T	G	C	C	A
UAM:	C	T	A	T	G	C	A	G	A	C	T	C	C	G	T	G	A	A	G	G	G	C	C	G	A	T	T	C	A	C	C	A	T	C	T	C	C	A	G	A	G	A	C	A	A	C	G	C	C	A
HUM:	A	G	A	A	C	T	C	A	C	T	G	T	A	T	C	T	G	C	A	A	A	T	G	A	A	C	A	G	C	C	T	G	A	G	A	G	A	C	G	A	G	G	A	C	A	C	G	G	C	T
UAM:	A	G	A	A	C	T	C	A	C	T	G	T	A	T	C	T	G	C	A	A	A	T	G	A	A	C	A	G	C	C	T	G	A	G	A	G	C	C	G	A	G	G	A	C	A	C	A	G	C	T
HUM:	G	T	G	T	A	T	T	A	C	T	G	T	G	C	G	A	G	A	G	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UAM:	G	T	T	T	A	T	T	A	C	T	G	T	G	C	G	A	G	A	G	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	G	A	C	A	C	A	A	A	C	C	T
UAM:	G	A	C	A	C	A	A	A	C	C	T

IGHVIII-47-1

GENE ALIGN SEQ

HUM: A G G T C C C C T G T G A A G T T A A T T A C T G G A G T C T C T C A G A G A A A T A C T A C A G A
UAM: A G G T C C C C T G T G A A G T T A A T T A G T G G A G T C T C T C A G A G A A A T A C T A C A G A

HUM: C C A A G A A T T C T C A G A C T T T T C T G G A A A C C C T G T G G A T T C A C T T T C A C T G A
UAM: C C A A G A A T T C T C A G A C T T T T C T G G A A A G C C T C T G G A T T C A C T T T C A C T G A

HUM: A A A C A G C A T A A G C T T G G T C C A G C A G G C T T C A T G A C A G G G G T G G G T G T A G G
UAM: A A A C A G C A T A A G C T T C G T C C A G C A G G C T T C A T G A C A G G G G T T G G T G T G G G

HUM: T G A T A A C A T C A G T A A T T C A A G T G G A A G T T C T C A G T G G G A C T C T C C T T G A G
UAM: T G A T A A C A T C A G T A A T T C A A G T G G A A G T T C T C A G T G G G A C T C T C C T T G A C

HUM: T A C A A A G A A G A T T A A C A G T C C T C A G A G A C A C G C T T T T C A G A T G A T T C T C T
UAM: T A C A A A G A A G A T T A A C A G T C C T C A G A G A C A C T C T T T T C A G A T G A T T C T C T

HUM: C T T A A G A T G A T T A A C C T G A G A G C T C A G G A A A A T T C C G T T T A T T A C T G T G A
UAM: T T T A A G A T G A T T A A C C T G A G A G C T C A G G A A A A T T C C G T T T A T T A C T G T G A

HUM: G G G A
UAM: G G G A

D7

HUM: C A C G G T G
UAM: C A C A G T G

D9

HUM: G A C A C A A A C C T
UAM: G A C A C A A A C C T

IGHV3-47

GENE ALIGN SEQ

HUM: C A C C A G G G A G T T T G T G C T A A G C T G G G T T T T C C T T G T T G C T A T A T T A A A A T
UAM: C A C C A T G G A G T T T G T G C T A A G C T G G G T T T T C C T T G T T G C T A T A T T A A A A T

HUM: G T G A T T C A T G G A G A A C T A G A G A G A T T G A G T G T G A G T T A C A T G A G T G A G A G
UAM: G T G A T T C A T G G A G A A C T A G A G A G A T T G A G T G T G A G T T A C A T G A G T G A G A G

HUM: A A A C A G T G G A T A T G T T T G G C A A T T T C T G A C T T T T G T G T C T C T G T G T T T G C
UAM: A A A C A G T G G A T A T G T T C G G C A A T T T C T G A C C T T G G T G T C T C T G T G T T T G C

HUM: A G G T G T C C A G T G T G A G G A T C A G C T G G T G G A G T C T G G G G G A G G C T T G G T A C
UAM: A G G T G T C C A G T G T G A G G A T C A G C T G G T G G T G T C T G C G G G A G G C T T G G T A C

HUM: A G C C T G G G G G T C C C T G A G A C C C T C C T G T G C A G C C T C T G G A T T C G C C T T C
UAM: A G C C T G G G G G T C C C T G A G A C C C T C C T G T G C A G C C T C T G G A T T C G C C T T C

HUM: A G T A G C T A T G T T C T G C A C T G G G T T C G C C G G G C T C C A G G G A A G G G T C C G G A
UAM: A G T A G C T A T G T T C T G C A C T G G G T T C G C C G G G C T C C A G G G A A G G G T C T G G A

HUM: G T G G G T A T C A G C T A T T G G T A C T G G T G G T G A T A C A T A C T A T G C A G A C T C C G
UAM: G T G G G T A T C A G C T A T T G G T A C T G G T G G T G A T A C A T A C T A T G C A G A C T C C G

HUM: T G A T G G G C C G A T T C A C C A T C T C C A G A G A C A A C G C C A A G A A G T C C T T G T A T
UAM: T G A T G G G C C G A T T C A C C A T C T C C A G A G A C A A T G C C A A G A A G T C C T T G T A T

HUM: C T T C A A A T G A A C A G C C T G A T A G C T G A G G A C A T G G C T G T G T A T T A T T G T G C
UAM: C T T C A A A T G A A C A G C C T G A T A T C T G A G G A C A C G G C T G T G T A T T A C T G T G C

HUM: A A G A G A
UAM: A A G A G A

D7

HUM: C A C A G T G
UAM: C A C A G T G

D9

HUM: G A T A C A A A C T T
UAM: G A T A C A A A C T T

IGHVII-46-1

GENE ALIGN SEQ

HUM: A T G T C A T T A T C G T G T C T T C T C C T G T G C C T G G T A G C A G G T C C T G A A G G T G A
UAM: A T G T C A T T A T T G T G T C T T C T C C T G T G C C T G G T A A C A G G T C C C G A A G G T G A

HUM: A C G T C T C A G A T G T C A G A C A T G G G T C T A T C G G G T T A G G A T A G G T A C A T G T G
UAM: G T G T C T C A G A T G T C A G A C G T G G G T C T A T C G G G T G A G G A T A G G T A C A T G T G

HUM: A C T G A C A G G G A C T G A T T C T C C A T G T A A T C A C A T G C C C T G T C C C A G G A G C A
UAM: A C T G A C A G G G A C T G A T T C T C C A T G T A A T C A C A T G C C C T G T C C C A G G A G C A

HUM: G C T G C A G G A G T C A G C C C T G G A C C T G A A T A G C A C A C A C T T A C C C T C T G C C T
UAM: G C T G C A G G A G T C A G C C C T G G A C C T G A A T A G C A C A C A C T T A C C C T C T G C C T

HUM: C A C C T A C A C T G T T A C T G G C C A C T C C G T C A C A A C C A G T C C T T A C T A G T G G A
UAM: C A C C T A C A C C G T T T C T G G C C A C T C C A T C A C A A C C A G T C C T T A C T A G T G G A

HUM: C C T G G A T C T G C C G G C T C T C A G G G A G G G G C T G C A A T G G A T
UAM: C C T G G A T C T G C C A G C T C T C A G A G A G G G G C T G A A A T G G A T

D7
HUM: A A A A T C C
UAM: A A A A T G C

D9
HUM: C A T T T G T C T T G
UAM: C A C T G G T C T T G

IGHV1-46

GENE ALIGN SEQ

HUM:	A	T	G	G	A	C	T	G	G	A	C	C	T	G	G	A	G	G	G	T	C	T	T	C	T	G	C	T	T	G	C	T	G	G	C	T	G	T	A	G	C	T	C	C	A	G	G	T	A	A
UAM:	A	T	G	G	A	C	T	G	G	A	C	C	T	G	G	A	G	G	G	T	C	T	T	C	T	G	C	T	T	G	C	T	G	G	C	T	G	T	A	G	C	T	C	C	A	G	G	T	A	A
HUM:	A	G	G	G	C	C	A	A	C	T	G	G	T	T	C	C	A	G	G	G	C	T	G	A	G	G	A	A	G	G	A	T	T	T	T	T	C	C	A	G	T	T	T	A	G	A	G	G		
UAM:	A	G	G	G	C	C	A	A	C	T	A	G	T	T	C	C	A	G	G	G	C	T	G	A	G	G	A	T	G	G	G	A	T	T	T	T	T	C	C	A	G	T	T	T	A	G	A	G	G	
HUM:	A	C	T	G	T	C	A	T	T	C	T	C	T	A	C	T	G	T	G	T	C	C	T	C	T	C	C	G	C	A	G	G	T	G	C	T	C	A	C	T	C	C	C	A	G	G	T	G	C	A
UAM:	A	C	T	G	T	C	A	T	T	C	T	C	T	A	C	T	G	T	G	T	C	C	T	C	T	C	C	A	C	A	G	G	T	G	C	T	C	A	C	T	C	C	C	A	G	G	T	G	C	A
HUM:	G	C	T	G	G	T	G	C	A	G	T	C	T	G	G	G	G	C	T	G	A	G	G	T	G	A	A	G	A	A	G	C	C	T	G	G	G	G	C	C	T	C	A	G	T	G	A	A	G	G
UAM:	G	C	T	G	G	T	G	C	A	G	T	C	T	G	G	G	G	C	T	G	A	G	G	T	G	A	A	G	A	A	G	C	C	T	G	G	G	G	C	C	T	C	A	G	T	G	A	A	G	G
HUM:	T	T	T	C	C	T	G	C	A	A	G	G	C	A	T	C	T	G	G	A	T	A	C	A	C	C	T	T	C	A	C	C	A	G	C	T	A	C	T	A	T	A	T	G	C	A	C	T	G	G
UAM:	T	T	T	C	C	T	G	C	A	A	G	G	C	T	T	C	T	G	G	T	T	A	C	A	C	C	T	T	C	A	C	C	A	G	C	T	G	C	T	A	T	A	T	G	T	A	C	T	G	G
HUM:	G	T	G	C	G	A	C	A	G	G	C	C	C	C	T	G	G	A	C	A	A	G	G	G	C	T	T	G	A	G	T	G	G	A	T	G	G	G	A	A	T	A	A	T	C	A	A	C	C	C
UAM:	G	T	G	C	A	A	C	A	G	G	C	C	C	C	T	G	G	A	C	A	A	G	G	G	C	T	T	G	A	G	T	G	G	A	T	G	G	G	A	G	T	A	A	T	C	A	A	C	C	C
HUM:	T	A	G	T	G	G	T	G	G	T	A	G	C	A	C	A	A	G	C	T	A	C	G	C	A	C	A	G	A	A	G	T	T	C	C	A	G	G	G	C	A	G	A	G	T	C	A	C	C	A
UAM:	T	A	G	T	G	A	T	G	G	T	A	G	C	A	C	A	A	G	C	T	A	C	G	C	A	C	A	G	A	A	G	T	T	C	C	A	G	G	G	C	A	G	A	G	T	C	A	C	C	A
HUM:	T	G	A	C	C	A	G	G	G	A	C	A	C	G	T	C	C	A	C	G	A	G	C	A	C	A	G	T	C	T	A	C	A	T	G	G	A	G	C	T	G	A	G	C	A	G	C	C	T	G
UAM:	T	G	A	C	C	A	G	G	G	A	C	A	C	A	T	C	C	A	C	A	A	G	C	A	C	A	G	T	C	T	A	C	A	T	G	G	A	G	C	T	G	A	G	C	A	G	C	C	T	G
HUM:	A	G	A	T	C	T	G	A	G	G	A	C	A	C	G	G	C	C	G	T	G	T	A	T	T	A	C	T	G	T	G	C	G	A	G	A	G	A												
UAM:	A	G	A	T	C	T	G	A	G	G	A	C	A	C	G	G	C	C	G	T	G	T	A	T	T	A	C	T	A	T	G	C	A	A	G	A	G	A												

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	G	T	C	A	G	A	A	A	C	C	C
UAM:	G	T	C	A	G	A	A	A	C	C	C

IGHV1-45

GENE ALIGN SEQ

HUM:	A	T	G	G	A	C	T	G	G	A	C	C	T	G	G	A	G	A	A	T	C	C	T	C	T	T	C	T	T	G	G	T	G	G	C	A	G	C	A	G	C	C	A	C	A	G	G	T	A	A
UAM:	A	T	G	G	A	C	T	G	G	A	C	C	T	G	G	A	G	A	A	T	C	C	T	C	T	T	C	T	T	G	G	T	G	G	C	A	G	C	A	G	C	C	A	C	A	G	G	T	A	A
HUM:	G	G	G	G	C	T	C	C	C	A	A	G	T	C	C	C	A	G	T	G	A	T	G	A	G	G	A	G	G	G	A	T	T	G	A	G	T	C	C	A	G	T	C	A	A	G	G	T	G	
UAM:	G	G	G	G	C	T	C	C	C	A	A	G	T	C	C	C	A	G	T	G	A	T	G	A	G	G	A	G	G	G	A	T	T	G	A	G	T	C	C	A	G	T	C	A	A	G	G	T	G	
HUM:	G	C	T	T	T	T	A	T	C	C	A	C	T	C	C	T	G	T	G	T	C	C	C	C	T	C	C	A	C	A	G	A	T	G	C	C	T	A	C	T	C	C	C	A	G	A	T	G	C	A
UAM:	G	A	T	T	T	T	A	T	C	C	A	C	T	C	C	T	G	T	G	T	C	C	C	C	T	C	T	A	C	A	G	A	T	G	C	C	T	A	C	T	C	C	C	A	G	A	T	G	C	A
HUM:	G	C	T	G	G	T	G	C	A	G	T	C	T	G	G	G	G	C	T	G	A	G	G	T	G	A	A	G	A	A	G	A	C	T	G	G	G	T	C	C	T	C	A	G	T	G	A	A	G	G
UAM:	G	C	T	G	G	T	G	C	A	G	T	C	T	G	G	G	G	C	T	G	A	G	A	T	G	A	A	G	A	A	G	C	C	T	G	G	G	T	C	C	T	C	A	G	T	G	A	A	G	G
HUM:	T	T	T	C	C	T	G	C	A	A	G	G	C	T	T	C	C	G	G	A	T	A	C	A	C	C	T	T	C	A	C	C	T	A	C	C	G	C	T	A	C	C	T	G	C	A	C	T	G	G
UAM:	T	T	T	C	C	T	G	C	A	A	G	G	C	T	T	C	T	G	G	A	T	A	C	A	C	C	T	T	C	A	C	C	G	A	C	C	G	C	T	A	C	C	T	G	C	A	C	T	G	G
HUM:	G	T	G	C	G	A	C	A	G	G	C	C	-	C	C	C	G	G	A	C	A	A	G	C	G	C	T	T	G	A	G	T	G	G	A	T	G	G	G	A	T	G	G	A	T	C	A	C	A	C
UAM:	G	T	G	C	G	A	C	A	G	G	C	C	T	-	-	-	G	G	A	C	A	A	G	A	G	C	T	T	G	A	G	T	G	G	A	T	G	G	G	A	T	G	G	A	T	C	A	C	A	C
HUM:	C	T	T	T	C	A	A	T	G	G	T	A	A	C	A	C	C	A	A	C	T	A	C	G	C	A	C	A	G	A	A	A	T	T	C	C	A	G	G	A	C	A	G	A	G	T	C	A	C	C
UAM:	C	T	T	A	C	A	A	T	G	G	T	A	A	C	A	C	C	A	A	C	T	A	T	G	C	A	C	A	G	A	A	G	T	T	C	T	A	G	G	A	C	A	G	A	G	T	C	A	C	C
HUM:	A	T	T	A	C	C	A	G	G	G	A	C	A	G	G	T	C	T	A	T	G	A	G	C	A	C	A	G	C	C	T	A	C	A	T	G	G	A	G	C	T	G	A	G	C	A	G	C	C	T
UAM:	A	T	T	A	C	C	A	G	G	G	A	C	A	G	G	T	C	T	A	T	G	A	G	C	A	C	A	G	C	C	T	A	C	A	T	G	G	A	G	C	T	G	A	G	C	A	G	C	C	T
HUM:	G	A	G	A	T	C	T	G	A	G	G	A	C	A	C	A	G	C	C	A	T	G	T	A	T	T	A	C	T	G	T	G	C	A	A	G	A	T	A											
UAM:	G	A	G	A	C	C	T	G	A	G	G	A	C	A	C	A	G	C	C	G	T	G	T	A	T	T	A	C	T	G	T	G	C	A	A	G	A	T	A											

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	G	T	C	A	G	A	A	A	C	C	C
UAM:	G	T	C	A	G	A	A	A	C	C	C

IGHVII-44-2

GENE ALIGN SEQ

HUM:	C	T	C	T	T	C	C	T	C	A	C	A	T	G	C	C	C	C	A	T	T	T	C	T	G	G	G	T	T	G	T	C	C	A	T	C	C	C	A	A	C	C	A	A	C	A	G	T	T	A
UAM:	C	T	G	T	T	C	C	T	C	A	C	A	T	G	C	C	C	C	A	T	T	T	C	T	G	G	G	T	T	G	T	C	C	A	T	C	C	C	A	A	C	C	A	A	C	A	G	T	T	A
HUM:	C	T	G	C	T	G	G	A	G	C	T	G	A	A	T	C	C	A	C	T	A	G	C	C	C	G	C	T	T	C	C	A	T	G	G	G	C	T	G	T	C	A	G	G	A	A	C	A	C	A
UAM:	C	T	G	C	T	G	G	A	G	C	T	G	C	A	T	C	C	A	C	T	A	G	C	C	C	G	C	T	T	C	C	A	T	G	G	G	C	T	G	T	C	A	G	G	A	A	C	A	C	A
HUM:	T	T	G	C	A	A	G	G	G	T	G	A	C	A	C	A	C	A	C	G	A	T	G	A	T	C	C	A	T	C	T	C	T	G	C	A	G	A	G	C	C	A	A	C	T	C	T	C	C	T
UAM:	T	T	G	C	A	A	G	G	G	T	G	A	C	A	C	A	C	G	C	G	A	T	G	A	T	C	C	A	T	C	T	C	T	G	C	A	G	A	G	C	C	A	A	C	T	C	T	C	C	T
HUM:	T	C	T	C	C	A	G	A	G	A	T	T	C	A	T	C	C	A	A	G	A	A	C	A	A	T	T	T	T	G	A	C	T	A	T	A	C	C	T	G	A	G	C	T	C	T	G	T	G	
UAM:	T	C	T	C	C	A	G	A	G	A	T	T	C	A	T	C	C	A	A	G	A	A	C	A	A	T	T	T	T	G	A	C	T	A	T	A	C	C	T	G	A	G	C	T	C	T	G	T	G	
HUM:	A	C	A	T	C	T	G	A	G	G	A	C	A	T	G	G	T	T	T	G	T	A	T	T	A	C	T	G	T	G	C	A	A	G	A	C	A													
UAM:	A	C	A	T	C	T	G	A	G	G	A	C	A	T	G	G	T	T	T	G	T	A	T	T	A	C	T	G	T	G	C	A	A	G	A	T	A													

D7

HUM:	A	A	C	A	G	T	G
UAM:	A	A	C	A	G	T	G

D9

HUM:	G	A	C	A	T	A	A	A	C	C	T
UAM:	G	A	C	A	T	A	A	A	C	C	T

IGHVIV-44-1

GENE ALIGN SEQ

HUM:	A	T	G	G	C	C	C	T	C	C	G	C	T	A	C	T	C	C	T	T	C	T	C	T	G	C	C	T	G	C	T	G	G	C	T	G	C	C	C	T	C	T	G	T	G	G	T	G	A	
UAM:	-	T	G	G	C	C	G	C	T	C	C	G	C	T	A	C	T	C	C	T	T	C	T	C	T	G	C	C	T	G	C	T	G	G	C	T	G	C	C	C	T	C	T	G	T	G	G	T	G	A
HUM:	G	T	T	A	C	T	C	A	T	G	A	T	T	T	C	A	T	A	C	G	T	G	G	G	G	A	G	A	C	A	C	G	G	G	A	T	G	A	G	G	C	A	A	A	T	G	T	G	T	C
UAM:	G	T	T	A	C	T	C	A	T	G	G	T	T	T	C	A	C	A	C	G	T	G	G	G	G	A	G	A	C	A	C	G	G	G	A	T	G	A	G	A	C	A	A	A	T	G	T	G	T	C
HUM:	T	G	T	G	A	C	T	C	A	C	A	G	A	T	G	T	T	C	T	C	T	A	T	T	C	T	C	A	G	G	G	G	T	T	C	A	C	A	G	T	G	A	G	G	A	C	C	A	C	C
UAM:	T	-	-	G	A	C	T	C	A	C	A	G	A	T	G	T	T	C	T	C	T	A	C	T	C	T	C	A	G	G	G	G	T	T	C	A	C	A	G	T	G	A	G	G	A	C	C	A	C	C
HUM:	T	T	G	T	G	C	A	A	T	G	G	G	A	G	G	A	A	G	A	A	G	T	A	G	T	G	G	T	C	C	C	C	T	T	G	G	T	C	A	T	G	C	T	C	A	G	C	C	T	C
UAM:	T	T	G	T	G	C	A	A	T	G	G	G	A	G	G	A	A	G	A	A	G	T	A	G	T	G	G	T	C	C	C	C	T	T	G	G	T	C	A	T	G	C	T	C	A	G	C	C	T	C
HUM:	A	C	C	T	A	-	T	G	C	C	G	C	C	T	A	T	G	C	A	C	A	T	T	C	A	A	T	T	T	C	T	G	A	A	C	A	T	T	C	T	G	T	T	C	C	T	G	G	A	
UAM:	A	C	C	-	A	G	T	G	C	C	G	C	C	T	A	C	G	C	A	C	A	T	T	C	A	A	T	T	T	C	T	G	A	A	C	A	T	-	-	T	G	T	T	T	C	C	T	G	G	A
HUM:	T	C	C	A	C	C	A	T	C	T	C	C	C	A	T	C	A	A	A	A	G	G	T	C	T	T	C	A	G	T	G	T	G	T	T	G	G	T	G	T	G	A	T	A	T	G	G	G	T	T
UAM:	T	C	C	A	C	C	A	T	C	T	C	C	C	A	T	C	A	A	A	A	G	G	T	C	T	T	G	A	G	T	G	T	G	T	T	G	G	T	G	T	G	A	T	A	T	G	G	G	T	T
HUM:	A	A	G	G	G	A	A	C	A	C	T	A	-	-	-	-	A	G	C	C	C	C	A	A	C	C	T	T	C	A	G	G	G	C	A	G	A	G	C	T	A	G	C	A	T	C	T	C		
UAM:	A	A	G	G	G	A	A	A	C	A	C	T	A	A	C	T	G	C	A	G	C	C	C	C	A	A	C	C	T	T	C	A	G	G	G	C	A	G	A	G	C	T	A	G	C	A	T	C	T	C
HUM:	C	A	G	A	A	A	C	A	C	A	T	A	G	T	A	A	A	A	A	A	C	A	A	G	A	A	A	A	C	T	T	A	C	A	G	C	T	G	A	G	A	A	G	T	G	T	G	A	T	G
UAM:	C	A	G	A	A	A	C	A	C	A	T	A	G	T	G	A	A	A	A	A	C	A	A	G	A	A	A	A	C	T	T	A	C	A	G	C	T	G	A	G	A	A	G	T	G	T	G	A	T	G
HUM:	G	C	T	G	G	G	A	T	G	C	A	G	G	C	G	T	G	T	A	T	T	A	C	T	G	T	G	C	T	C	A	A	G	G																
UAM:	G	C	T	G	A	G	G	A	T	G	C	A	G	G	C	G	T	G	T	A	T	T	A	C	T	T	T	G	C	T	C	A	A	G	G															

D7

HUM:	C	A	C	T	G	T	G
UAM:	C	A	C	T	G	T	G

D9

HUM:	G	A	C	A	C	A	A	A	C	C	T
UAM:	G	A	C	A	C	A	A	A	C	C	T

IGHVIII-44

GENE ALIGN SEQ

HUM: A T G T T G T T T G G G C T G A G C T G G G C T T T C C T T G T T A C T A T T T T A A G A G G T G A
UAM: A T G T T G T T T G G G C T G A G C T G G G C T T T C C T T G T T A C T A T T T T A A G A G G T G A

HUM: T T C A T G A A G A A C T A C A G A T A T T G T T T G T G A G T G G A T A T T A G A G A A A C A G T
UAM: T T C A T G A A G A A C T A C A G A T A T T G T T T G T G A G T G G A T A T T A G A G A A A C A G T

HUM: G G A T A T G T G T G G C A G T T G C T G A C C A G G A T T T C T C T G T G T T T G C A G G T G T G
UAM: G G A T G T G T G T G G C A G T T T C T G A C C A G G A T G T C T C T G T G T T T G C A G G T G T G

HUM: C A G T A T G A G G T G C A G C T G G T A G A G T C T
UAM: C A G T A T G A G G T G C A G C T G G T A G A G T C T

D7

HUM: T T T T T T T
UAM: T T T T T T T

D9

HUM: G A A C A T C C A T G
UAM: A C C C A T A G G T T

IGHVII-43-1

GENE ALIGN SEQ

HUM: T C T G G A T T C C C C A A C A G A A C C A G T G C T T C C T G C T G G A G C T G G A T C C A T C A
UAM: G C T G G A T T C C C C A A C A A A A C C A G T G C T T C C T G C T G G A G C T G G A T C C A T C A

HUM: G C C C C C A G G G A A G G G A C T G G A G T G G G T C A G G T G C A C A G G T C A T G A A G G G A
UAM: G C C C C C A G G G A A G G G A T T G G A G T G G G T C G G G T G C A C A G G T C A T G A A A G G A

HUM: G C A C A A A T T C T A A C C C A C T C C T C A A G A G T C C A G T C A C C A C C T C C A G A T C T
UAM: G C A C A A A T T C C A A C C C A C T C C T C A A G A G T C C A G T C A C C A C C T C C A G A T C T

HUM: A T G T C C A A A A A - - C A G C T C T T C G T A T G G C T G A G T G A C A T - T - A G C A A C A A
UAM: A T G T C C A A A A A A T - A G C T C T T C C T A T G G C T G A G T G A - - T G T G A G C A A C A A

HUM: G C A C A C A G C C A T G - - - - - T
UAM: G C A C A C A A C C A T G T T T A T T T T

D7

HUM:	T	T	G	T	T	T	T
UAM:	T	T	G	T	T	T	T

D9

HUM: G T G T G T G T T T T
UAM: T T T T G A T A G A G

IGHV3-43

GENE ALIGN SEQ

HUM:	A	T	G	G	A	G	T	T	T	G	G	A	C	T	G	A	G	C	T	G	G	G	T	T	T	T	C	C	T	T	G	T	T	G	C	T	A	T	T	T	T	A	A	A	A	G	G	T	G	A
UAM:	A	T	G	G	A	G	T	T	T	G	G	A	C	T	G	A	G	C	T	G	G	G	T	T	T	T	C	C	T	T	G	T	T	G	C	T	A	T	T	T	T	A	A	A	A	G	G	T	G	A
HUM:	T	T	C	A	T	G	G	A	T	A	A	A	T	A	G	A	G	A	T	G	T	T	G	A	G	T	G	T	G	A	G	T	G	A	A	C	A	T	G	A	G	T	G	A	G	A	G	A	A	A
UAM:	T	T	C	A	T	G	G	A	G	A	A	A	T	A	G	A	G	A	T	G	T	T	G	A	G	T	G	T	G	A	G	T	G	A	A	C	A	T	G	A	G	T	G	A	G	A	G	A	A	A
HUM:	C	A	G	T	G	G	A	T	A	T	G	T	G	T	G	G	C	A	G	T	G	T	C	T	G	A	C	C	A	G	G	G	T	G	T	C	T	C	T	G	T	G	T	T	T	G	C	A	G	G
UAM:	C	A	G	T	G	G	A	T	T	T	G	T	G	T	G	G	C	A	C	T	T	T	C	T	G	A	C	T	A	G	G	G	T	G	T	C	T	C	T	G	T	G	T	T	T	G	C	A	G	G
HUM:	T	G	T	C	C	A	G	T	G	T	G	A	A	G	T	G	C	A	G	C	T	G	G	T	G	G	A	G	T	C	T	G	G	G	G	A	G	T	C	G	-	-	T	G	G	T	A	C	A	
UAM:	T	G	T	C	C	A	G	T	G	T	G	A	A	G	T	G	C	A	G	C	T	G	G	T	G	G	A	G	T	C	T	G	A	G	G	A	G	-	-	G	C	T	T	G	G	T	A	C	A	
HUM:	G	C	C	T	G	G	G	G	G	T	C	C	C	T	G	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	G	A	T	T	C	A	C	C	T	T	T	G	
UAM:	G	C	C	T	G	G	G	G	G	T	T	C	C	C	T	G	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	G	A	T	T	C	A	C	C	T	T	T	G
HUM:	A	T	G	A	T	T	A	T	A	C	C	A	T	G	C	A	C	T	G	G	G	T	C	C	G	T	C	A	A	G	C	T	C	C	G	G	G	G	A	A	G	G	G	T	C	T	G	G	A	G
UAM:	A	T	G	A	T	T	A	T	G	C	C	A	T	G	C	A	C	T	G	G	G	T	C	C	G	T	C	A	A	G	C	T	C	C	A	G	G	A	A	G	G	G	T	C	T	G	A	A	G	
HUM:	T	G	G	G	T	-	C	T	C	T	C	T	-	-	T	A	T	T	A	G	T	T	G	G	G	A	T	G	G	T	G	G	T	A	G	C	A	C	A	T	A	C	T	A	T	G	C	A	G	A
UAM:	T	G	G	G	T	T	-	-	-	T	C	T	G	G	T	A	T	T	A	A	T	T	G	G	A	A	T	G	G	T	G	G	T	A	G	C	A	C	A	T	A	C	T	A	T	G	C	A	G	A
HUM:	C	T	C	T	G	T	G	A	A	G	G	G	C	C	G	A	T	T	C	A	C	C	A	T	C	T	C	C	A	G	A	G	A	C	A	A	C	A	G	C	A	A	A	A	A	C	T	C	C	C
UAM:	T	T	C	T	G	T	G	A	A	G	G	G	C	C	G	A	T	T	C	A	C	C	A	T	C	T	C	C	A	G	A	G	A	C	A	A	C	A	G	C	A	A	A	A	A	C	T	C	C	C
HUM:	T	G	T	A	T	C	T	G	C	A	A	A	T	G	A	A	C	A	G	T	C	T	G	A	G	A	A	C	T	G	A	G	G	A	C	A	C	C	G	C	C	T	T	G	T	A	T	T	A	C
UAM:	T	G	T	A	T	C	T	G	C	A	A	A	T	G	A	A	C	A	G	T	C	T	G	A	G	A	G	C	T	G	A	G	G	A	C	A	C	G	G	C	C	T	T	G	T	A	T	T	A	C
HUM:	T	G	T	G	C	A	A	A	A	G	A	T	A																																					
UAM:	T	G	T	G	C	A	A	A	A	G	A	C	A																																					

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	G	A	C	A	A	A	A	C	C	T
UAM:	G	A	C	A	A	A	A	C	C	T

IGHV3-42

GENE ALIGN SEQ

HUM:	T	T	G	T	T	T	C	G	G	A	G	T	T	T	G	A	A	G	G	T	G	A	T	T	T	A	T	G	G	A	G	A	A	T	G	A	G	A	G	A	T	G	T	T	G	A	G	T	G	C		
UAM:	T	T	G	T	T	T	C	G	G	A	G	T	T	T	G	A	A	G	G	T	G	A	T	T	T	A	T	A	G	A	G	A	A	T	G	A	G	A	G	A	T	G	T	T	G	A	G	G	C			
HUM:	G	A	G	T	G	G	A	C	A	T	G	A	G	T	G	A	G	A	G	A	A	A	C	A	G	T	A	G	A	T	A	T	G	T	G	T	G	G	C	C	G	T	T	T	C	T	G	A	C	C		
UAM:	A	A	G	T	G	G	A	C	A	T	G	A	G	T	G	A	G	A	G	A	A	A	C	A	G	T	G	G	A	T	A	T	G	T	G	T	G	G	C	C	G	T	T	T	C	T	G	A	C	C		
HUM:	A	G	G	G	T	G	T	C	T	C	T	G	T	G	T	T	T	G	C	A	G	G	C	G	T	C	C	A	G	C	G	T	G	A	G	G	C	G	C	A	G	C	T	G	G	T	G	G	A	G		
UAM:	A	G	G	G	T	G	T	C	T	C	T	G	T	G	A	T	T	G	C	A	G	G	C	T	T	C	C	A	G	C	G	T	G	A	G	G	C	A	C	A	G	C	T	G	G	T	G	G	A	G		
HUM:	T	C	T	G	G	G	G	A	G	G	C	T	T	G	G	-	-	T	A	C	A	G	C	C	T	G	G	G	T	G	G	G	T	C	C	C	C	G	A	G	A	C	T	C	T	C	A	T	T			
UAM:	T	C	T	G	G	G	G	A	G	G	C	T	T	G	G	T	A	T	A	C	A	G	C	C	T	G	G	G	T	G	G	G	T	C	C	C	T	G	A	G	A	C	T	C	T	C	A	T	T			
HUM:	T	G	C	A	G	C	T	T	C	T	A	G	A	T	T	C	A	C	C	T	T	C	A	G	T	G	A	C	T	T	C	T	G	A	A	T	G	C	A	C	T	G	G	A	T	C	C	G	C	C		
UAM:	T	G	C	A	G	C	C	T	C	T	G	G	A	T	T	C	A	C	C	T	T	C	A	G	T	G	A	C	T	T	C	T	G	G	A	T	G	C	A	C	T	G	G	A	T	C	C	G	C	C		
HUM:	A	G	G	C	T	T	C	T	G	G	G	A	A	A	G	G	G	C	T	G	G	A	G	T	G	G	G	T	T	G	G	C	C	G	T	A	T	T	A	G	A	A	C	C	A	A	A	C	G	T		
UAM:	A	G	G	C	T	T	C	T	G	G	C	A	A	A	G	G	G	C	T	G	G	A	G	T	G	G	G	T	T	G	G	C	C	G	T	A	T	T	A	G	A	A	C	C	A	A	A	C	G	T		
HUM:	A	A	C	A	G	T	T	A	C	A	C	G	A	C	A	G	A	A	T	G	C	G	C	T	G	C	A	T	C	T	G	T	G	A	A	A	G	G	C	A	G	G	T	T	C	A	C	C	A	T		
UAM:	A	A	C	A	G	T	T	A	C	G	T	G	A	C	A	G	A	A	T	G	C	G	C	T	G	C	A	T	C	T	G	T	G	A	A	A	G	G	C	A	G	G	T	T	C	A	C	C	A	T		
HUM:	C	T	C	A	A	G	A	G	A	T	G	A	T	T	C	A	A	A	G	A	A	C	A	C	A	C	A	C	T	G	T	A	T	C	T	G	C	A	A	G	T	G	A	A	T	A	C	C	C	T	G	A
UAM:	C	T	C	A	A	G	A	G	A	T	G	A	T	T	C	A	A	A	G	A	A	C	A	C	A	C	A	C	T	G	T	A	T	A	T	G	C	A	A	A	T	G	A	A	T	A	C	C	C	T	G	A
HUM:	A	A	A	C	C	G	A	G	T	-	-	-	-	A	C	A	C	G	G	C	C	A	T	C	T	A	T	T	A	C	T	G	T	A	C	T	A	G	A	G	A											
UAM:	A	A	A	C	-	-	-	-	T	G	A	G	G	A	C	A	C	G	G	C	C	A	T	C	T	A	T	T	A	C	T	G	T	A	C	T	A	G	A	G	A											

D7

HUM:	C	A	G	T	G	A	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	A	C	A	C	A	A	A	T	C	T	C
UAM:	T	A	C	A	C	A	A	A	T	C	T

IGHV3-41

GENE ALIGN SEQ

HUM: A T G G A G T C A T G G C T G A G C T G G G T T T T T C T T G C C G C T A T T T T A A A A G G T A A
UAM: A T G G A G T C A T G G C T G A G C T G G G T T T T T C T T G T T G C T A T T T T A A A A G G T A A

HUM: T T C A T T G A G A A C T A T T G - - A A A T T G A G T G T G A G T G G A T A A G A G T G A G A T A
UAM: T T C A T G G A G A A C T A - - G A A A A A T T G A G T G T G A G T G G A T A A G A G T G A G A T A

HUM: A A C A G T G G A T A C G T G T G G C A G T T T C T G A C C A G G G T T T C T T T G T - G T T T G C
UAM: A A C A G T G G A T A T G T G T G G A A G T T T C T G A C C A C A G T T A C T T T - T C G T T T A C

HUM: A G G T G T C C A G T G T G A G G T G C A G C T G G T G G A G T C T G G G G G A G G C T T G G T C C
UAM: A G G T G T C C A G T G T G A G G T G C A G C T G A T G G A A T C T G G G G G A G G T T T G G T A C

HUM: A G C C T G G G G G T C C C T G - - - - A G A C T C T C C T G T G C A G C C T C A G G A T T C T C
UAM: A G C C T G G G G G T C - - T G T A A A - - A C T C T C T T G T G C A G C C T C A G G A T T C A C

HUM: C T T T A G T A G C T A T G G C A T G A G - C T G G G T C C G C C A G G C T C C A G G G A A G G G G
UAM: C T T T A G T A G C T A T G G C A T G - G A C T G G G T C T G C C A G G C T C C A G G C A A G G G G

HUM: C T G G A G T G A G T G G C A C A T A T C T G G A A T G A T G G A A G T C A G A A A T A C T A T G C
UAM: C T G G A G T G G G T G G T A C A T A T A T G G A A T G A T G G A A G T C A G A A A T A C T A T G C

HUM: A G A C T C T G T G A A G G G C C G A T T C A C A A T C T C C - G A G A C A A T T C T A A G A G C A
UAM: A G A C T C T G T G A A G G G C C A A T T C A C G A T C T C C A G A G A C A A T T C T A A G A G C A

HUM: T G C T C T A T C T G C A A A T G G A C A G T C T G A A A G C T A A G G A C A C G G C C A T G T A T
UAM: T G C T C T A T C T G C A A A T G G A C A G T C T G A A A G C T G A G G A C A C G G C C A T G T A T

HUM: T A C T G T A C C A G A C A
UAM: T A C T G T A C C A G A C A

D7
HUM: C A G T G A G
UAM: G A G T G A G

D9
HUM: C A C A A A C C T C C
UAM: C A C A A A C T T C C

IGHVII-40-1

GENE ALIGN SEQ

HUM:	A	G	C	C	T	G	G	T	G	A	A	G	C	C	C	T	T	G	C	A	A	A	C	C	C	C	T	C	A	C	T	C	A	C	C	T	G	T	G	C	T	G	C	C	T	C	T	G	G
UAM:	A	G	C	C	T	A	G	T	G	A	A	G	C	C	C	T	T	G	C	A	A	A	C	C	C	C	T	C	A	C	T	C	A	C	C	T	G	T	G	C	T	G	C	C	T	G	T	G	G

HUM:	A	T	T	C	T	C	T	G	T	C	A	C	A	A	T	C	A	G	T	G	C	T	T	C	C	T	G
UAM:	A	T	T	C	T	C	C	A	T	C	A	C	A	A	T	C	A	G	T	G	C	T	T	C	C	T	G

D7

HUM:	T	A	G	G	C	A	C
UAM:	T	A	G	G	C	A	C

D9

HUM:	G	T	C	A	G	G	T	G	C	A	T
UAM:	G	T	C	A	G	G	T	G	C	A	T

IGHV7-40

GENE ALIGN SEQ

HUM: T A T G G T A T G A A T T C A G T G T G A C C A G C C C C T G G A C A A G G G C T T G A G T G G A T
UAM: T A T G G T A T G A A T T C G G T G T G A C C G G C C C C T G G A C A A G G G C T T G A G T G G A T

HUM: G G G A T G G A T C A T C A C C T A C A C T G G G A A C C C A A C A T A T A C C A A C - - G G C T T
UAM: G G G A T G G A T C A T C A C C T A C A C T G G G A A C C C A A G G T A T A C C - - C A T G G C T T

HUM: C A C A G G A C G G T T T C T A T T C T C C A T G G A C A C C T C T G T C A G C A T G G C G T A T C
UAM: C C C A G G A C G G T T T G T C T T C T C C A T G G A G A C C T C T G T C A G C A T G G C A T A T C

HUM: T G C A G A T C A G C A G C C T A A A G G C T G A G G A C A C G G C C G T G T A T G A C T G T A T G
UAM: T G C A G A T C A G C A G C C T A A A G G C T G A G G A C A T G G C C A T G T A T G A C T G T A T G

HUM: A G A G A
UAM: A G A G A

D7
HUM: C A C A G T G
UAM: C A C A G T G

D9
HUM: G T C A G A A A C C C
UAM: G T C A G A A A C C C

IGHV4-39

GENE ALIGN SEQ

HUM:	A	T	G	A	A	G	C	A	C	C	T	G	T	G	G	T	T	C	T	T	C	C	T	C	C	T	G	C	T	G	G	T	G	G	C	G	G	C	T	C	C	C	A	G	A	T	G	T	G	A
UAM:	A	T	G	A	A	A	C	A	C	C	T	G	T	G	G	T	T	C	T	T	C	C	T	C	C	T	C	C	T	G	G	T	G	G	C	A	G	C	T	C	C	C	A	G	A	T	G	T	G	A
HUM:	G	T	G	T	T	T	C	T	-	-	A	G	G	A	T	G	C	A	G	A	C	A	T	G	G	A	G	A	T	A	T	G	G	G	A	G	G	C	T	G	C	C	T	C	T	G	A	T	C	C
UAM:	G	T	G	T	-	-	C	T	C	A	A	G	G	C	T	G	C	A	G	A	C	A	T	G	G	A	G	A	T	A	T	G	G	G	A	G	G	C	T	G	C	C	T	C	T	G	A	T	C	C
HUM:	C	A	G	G	G	C	T	C	A	C	T	G	T	G	G	G	T	T	T	T	C	T	G	T	T	C	A	C	A	G	G	G	G	T	C	C	T	G	T	C	C	C	A	G	C	T	G	C	A	
UAM:	C	A	G	G	G	C	T	C	A	C	T	G	T	G	G	G	T	C	T	C	T	C	T	G	T	T	C	A	C	A	G	G	G	G	T	C	C	T	G	T	C	C	C	A	G	G	T	G	C	A
HUM:	G	C	T	G	C	A	G	G	A	G	T	C	G	G	G	C	C	C	A	G	G	A	C	T	G	G	T	G	A	A	G	C	C	T	T	C	G	G	A	G	A	C	C	C	T	G	T	C	C	C
UAM:	G	C	T	G	C	A	G	G	A	G	T	C	G	G	G	C	C	C	A	G	G	A	C	T	G	G	T	G	A	A	G	C	C	T	T	C	G	G	A	G	A	C	C	C	T	G	T	C	C	C
HUM:	T	C	A	C	C	T	G	C	A	C	T	G	T	C	T	C	T	G	G	T	G	G	C	T	C	C	A	T	C	A	G	C	A	G	T	A	G	T	A	G	T	T	A	C	T	A	C	T	G	G
UAM:	T	C	A	C	C	T	G	C	G	C	T	G	T	C	T	C	T	G	G	T	G	G	C	T	C	C	A	T	C	A	G	-	-	-	T	A	G	T	A	-	-	-	A	C	T	A	C	T	G	G
HUM:	G	G	C	T	G	G	A	T	C	C	G	-	-	-	-	C	C	A	G	C	C	C	C	C	A	G	G	G	A	A	G	G	G	G	C	T	G	G	A	G	T	G	G	A	T	T	G	G	G	-
UAM:	A	G	C	T	G	G	A	T	C	C	G	G	C	A	A	C	C	A	-	-	-	-	C	C	A	G	G	G	A	A	G	G	G	G	C	T	G	G	A	G	T	G	G	A	T	T	G	G	G	C
HUM:	A	G	T	A	T	C	T	A	T	T	A	T	A	G	T	G	G	G	A	G	C	A	C	C	T	A	C	-	T	A	C	A	A	C	C	C	G	T	C	C	C	T	C	A	A	G	A	G	T	C
UAM:	A	-	T	A	T	C	C	A	T	T	A	T	G	G	T	G	G	T	A	G	C	A	A	C	T	A	C	C	T	-	C	A	A	C	C	C	G	T	C	C	C	T	C	A	A	G	A	G	T	C
HUM:	G	A	G	T	C	A	C	C	A	T	A	T	C	C	G	T	A	G	A	C	A	C	G	T	C	C	A	A	G	A	A	C	C	A	G	T	T	C	T	C	C	C	T	G	A	A	G	C	T	G
UAM:	G	A	G	T	C	A	C	C	A	T	A	T	C	A	G	T	A	G	A	C	A	C	G	T	C	C	A	A	G	A	A	C	C	A	G	T	T	C	T	C	C	C	T	G	A	A	G	C	T	G
HUM:	A	G	C	T	C	T	G	T	G	A	C	C	G	C	C	G	C	A	G	A	C	A	C	G	G	C	T	G	T	G	T	A	T	T	A	C	T	G	T	G	C	G	A	G	A	C	A			
UAM:	A	G	C	T	C	T	G	T	G	A	C	C	G	C	C	G	C	A	G	A	C	A	C	A	G	C	C	G	T	G	T	A	T	T	A	C	T	G	T	G	C	G	A	G	A	G	A			

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	G	A	C	A	A	A	A	C	C	T	
UAM:	G	A	C	A	C	A	A	A	C	T	T

IGHVIII-38-1

GENE ALIGN SEQ

HUM: A A G T C C T C T G T G A A G T T A A C T A G T G G A G T C A G A C A G G - - A A A A T A C T A C A
UAM: A A G T C C T C T G T G A A G T T A A C T A G T G G A G T C A G A C A G G G C - - - - - C T A C A

HUM: G A C C A A G A A T T C T C A G A C T G T T C T G C A A A G C C C C T G G A T T C A C T G A A A A A
UAM: G A C G A A G A A T T C T C A G A C T G T T C T G C A A A G C C C C T A G A T T C A C T G A A A A C

HUM: A G A A C A A G T T T G G T C C A G C A G G A T T C A T G G C A A G T G T T G G T G A G G G A G A T
UAM: A G A A C A A G T T T G G T C C A G C A G A T T C A T G A C A A G G G T T G G T G T G G G A G A T

HUM: A A C A G T A A T T C A A G T G G A A G T T C T C A A T G G G A C T C G C C T T C A G T A C A A A G
UAM: A A C A G T A A T T C A A G T G G A A G T T C T C A A T G G G A C T C T C C T T C A G T A C A A A G

HUM: A A G A T T A A C A G T C C T C A G A G A C A C T G T T C A G A A G A T T C T C T T T T A A G A T A
UAM: A A G A T T A A C A G T C C T C A G A G A C A C T G T T C A G A A G A T T C T C T T T T A A G A T A

HUM: A T A A A A C T G A G A G C C C A A G A C A A G T C T G T G T A T T A C T G T G A G G G A
UAM: A T T A A A C T G A G A G C C C A G G A C A A G T C C G T G T A T T A C T G T G A G G G A

D7

HUM: C A C A G T G
UAM: G A C A G T G

D9

HUM: G A C A C A A A A G T
UAM: G A C A C A A A A C T

IGHV3-38

GENE ALIGN SEQ

HUM:	A	T	G	C	A	G	T	T	T	G	T	G	C	T	G	A	G	C	T	G	G	G	T	T	T	T	C	C	T	T	G	T	T	G	G	T	A	T	T	T	T	A	A	A	A	G	G	T	G	A	
UAM:	A	T	G	C	A	G	T	T	T	G	T	G	C	T	G	A	G	C	T	G	G	G	T	T	T	T	C	C	T	T	G	T	T	G	C	T	G	T	T	T	T	A	A	A	A	G	G	T	G	A	
HUM:	T	T	C	A	T	G	G	A	G	A	A	C	T	A	C	A	G	A	T	G	T	T	G	A	G	T	G	T	G	A	G	T	G	G	A	C	A	T	G	A	G	T	G	A	G	C	A	A	A	A	
UAM:	T	T	C	A	T	G	G	A	G	A	A	C	T	A	C	A	G	A	T	G	T	T	G	A	G	T	G	T	G	A	G	T	G	G	A	C	A	T	G	A	G	T	G	A	G	C	A	A	A	A	
HUM:	C	A	G	T	G	G	G	T	T	T	G	T	G	T	G	G	C	A	G	T	T	T	C	T	G	A	C	C	T	T	G	G	T	G	T	C	T	C	T	G	T	G	T	T	T	G	C	A	G	G	
UAM:	C	A	G	T	G	G	G	T	A	T	G	T	G	T	G	T	C	A	G	T	T	T	C	T	G	A	C	C	T	T	G	G	T	G	T	C	T	C	T	G	T	G	T	T	T	G	C	A	G	G	
HUM:	T	G	T	C	C	A	G	T	G	T	G	A	G	G	T	G	C	A	G	C	T	G	G	T	G	G	A	G	T	C	T	G	G	G	G	A	G	G	C	T	T	G	G	T	A	C	A	G	C		
UAM:	T	G	T	C	C	A	G	T	G	T	G	A	G	G	T	G	C	A	G	C	T	G	G	T	G	G	A	G	T	C	T	G	G	G	G	A	G	G	C	T	T	G	G	T	A	C	A	G	C		
HUM:	C	T	A	G	G	G	G	T	C	C	C	T	G	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	G	A	T	T	C	A	C	C	G	T	C	A	G	T		
UAM:	C	T	G	G	G	G	G	T	C	C	C	T	C	A	G	A	C	T	C	T	C	C	T	A	T	G	C	A	G	C	C	T	C	T	G	G	A	T	T	C	A	C	T	G	T	C	A	G	T		
HUM:	A	G	C	A	A	T	G	A	G	A	T	G	A	G	C	T	G	G	A	T	C	C	G	C	C	A	G	G	C	T	C	C	A	G	G	A	A	G	G	G	G	C	T	G	G	A	G	T	G		
UAM:	A	G	C	A	A	T	G	A	G	A	T	G	A	G	C	T	G	G	A	T	C	C	G	C	C	A	G	G	C	T	C	C	A	G	G	A	A	G	G	G	G	C	T	G	G	A	G	T	G		
HUM:	G	G	T	C	T	C	A	T	C	C	A	T	T	A	G	T	-	-	-	G	G	T	G	G	T	A	G	C	A	C	A	T	A	C	T	A	C	G	C	A	G	A	C	T	C	C	A	G	-	G	
UAM:	G	G	T	C	T	C	A	A	C	C	A	T	T	A	G	T	A	G	A	G	G	T	G	G	T	A	G	C	A	C	A	T	A	C	T	A	C	A	C	A	G	A	C	T	C	C	-	G	T	G	
HUM:	A	A	G	G	G	C	A	G	A	T	T	C	A	C	C	A	T	C	T	C	C	A	G	A	G	A	C	A	A	T	T	C	C	A	A	G	A	A	C	A	C	G	C	T	G	T	A	T	C	T	
UAM:	A	A	G	G	G	C	A	G	A	T	T	C	A	C	C	A	T	C	T	C	C	A	G	A	G	A	C	A	A	T	T	C	C	A	A	G	A	A	C	A	C	G	C	T	G	T	A	T	C	T	
HUM:	T	C	A	A	A	T	G	A	A	C	A	A	C	C	T	G	A	G	A	G	C	T	-	G	A	G	G	G	C	A	C	G	G	C	C	G	T	G	T	A	T	T	A	C	T	G	T	G	C	C	
UAM:	T	C	A	A	A	T	G	A	A	C	A	G	C	C	T	G	A	G	A	G	-	T	G	G	A	G	G	A	C	A	C	G	G	C	T	G	T	G	T	A	T	T	A	C	T	G	T	G	C	G	
HUM:	A	G	A	-	T	A																																													
UAM:	A	G	A	G	-	-																																													
D7																																																			
HUM:	T	A	C	A	C	A	G																																												
UAM:	A	C	A	C	A	G	T																																												
D9																																																			
HUM:	G	A	C	A	C	A	A	A	C	C	T																																								
UAM:	A	A	A	C	A	C	A	A	A	C	C																																								

IGHV3-37

GENE ALIGN SEQ

HUM:	A	T	G	T	T	G	T	T	T	G	G	G	C	T	G	A	G	C	T	G	G	G	C	T	T	T	C	C	T	T	T	T	A	C	T	A	T	T	T	T	A	A	G	A	G	G	T	G	A	
UAM:	A	T	G	T	T	G	T	T	T	G	G	G	C	T	G	A	G	C	T	G	G	G	C	T	T	T	C	C	T	T	G	T	T	A	C	T	A	T	T	T	T	A	A	G	A	G	G	T	G	A
HUM:	T	A	C	A	T	G	A	A	G	A	A	C	T	A	C	A	G	A	T	A	T	T	G	T	T	C	G	T	G	A	G	T	G	G	A	T	A	T	T	A	G	A	G	A	A	A	C	A	G	T
UAM:	T	A	C	A	T	G	A	A	G	A	A	C	T	A	C	A	G	A	T	A	T	T	G	T	T	T	G	T	G	A	G	T	G	G	A	T	A	T	T	A	G	A	G	A	A	A	C	A	G	T
HUM:	G	G	A	T	A	T	G	T	G	T	G	G	C	A	G	T	T	T	C	T	G	A	C	C	A	G	G	A	T	G	T	C	T	C	T	G	T	G	T	T	T	G	C	A	G	G	T	G	T	G
UAM:	G	C	A	T	A	T	G	T	G	T	G	G	C	A	G	T	T	T	C	T	G	A	C	C	A	G	G	A	T	G	T	C	T	C	T	G	T	G	T	T	T	G	C	A	G	G	T	G	T	G
HUM:	C	A	G	T	A	T	G	A	G	G	T	G	C	A	G	C	T	G	G	T	A	G	A	G	T	C	T	G	G	G	G	A	G	A	C	T	T	G	G	T	A	C	A	G	C	T	G	T	G	
UAM:	C	A	G	T	A	T	G	A	G	G	T	G	C	A	G	C	T	G	G	T	A	G	A	G	T	C	T	G	G	G	G	A	G	A	C	T	T	G	G	T	A	C	A	G	C	T	G	T	G	
HUM:	G	T	G	G	G	G	T	T	G	G	G	G	T	G	T	C	C	T	G	A	G	A	C	T	C	T	C	A	T	G	T	G	C	A	G	C	C	T	G	C	G	G	A	T	T	C	A	T	C	
UAM:	G	C	G	G	G	G	T	T	G	G	G	G	T	G	T	C	C	T	G	A	G	A	C	T	T	T	C	C	T	G	T	G	C	A	G	C	C	T	G	T	G	G	A	T	T	C	A	C	C	
HUM:	T	T	G	A	G	A	A	G	C	A	A	T	G	A	C	A	T	G	A	A	C	T	G	G	G	C	C	C	A	C	C	G	G	G	C	T	T	C	A	A	G	A	A	A	G	G	G	G	C	T
UAM:	T	T	G	A	G	A	A	G	C	A	A	T	G	A	C	A	T	G	A	A	C	T	G	G	G	T	C	C	A	C	C	G	G	G	C	T	T	C	A	A	G	A	A	A	G	G	G	G	C	T
HUM:	G	G	A	A	T	G	G	G	T	C	T	C	A	T	A	C	A	T	T	A	G	T	G	C	T	A	G	T	G	G	T	G	G	T	A	G	C	C	T	A	T	A	C	T	A	T	G	C	A	G
UAM:	G	G	A	G	T	G	A	G	T	C	T	C	A	T	A	C	A	T	T	A	G	T	G	C	T	A	G	T	G	G	T	G	G	T	A	G	C	C	T	A	T	A	C	T	A	T	G	C	A	G
HUM:	A	C	A	C	T	G	A	A	G	G	G	T	A	G	A	T	T	C	A	C	C	A	T	C	T	C	T	A	G	A	G	A	C	A	A	T	G	G	C	A	A	G	A	A	C	A	T	G	C	T
UAM:	A	C	A	C	T	G	A	A	G	G	G	T	A	G	A	T	T	C	G	C	C	A	T	C	T	G	T	A	G	A	G	A	C	A	A	T	G	G	C	A	A	G	A	G	C	A	T	G	C	T
HUM:	G	T	A	C	T	T	G	C	A	A	A	T	G	A	A	C	A	G	T	C	T	G	A	G	A	G	A	T	G	A	G	G	A	C	T	C	G	G	C	T	G	T	G	T	G	A	G	A	G	A
UAM:	G	T	A	C	T	T	G	C	A	A	A	T	G	C	A	C	A	G	T	C	T	G	A	G	A	G	A	T	G	A	G	G	A	C	T	C	G	G	C	C	G	T	G	T	G	A	G	A	G	A

D7

HUM:	C	A	T	G	G	T	G
UAM:	C	A	T	G	G	T	G

D9

HUM:	G	C	C	A	G	A	A	A	C	C	T
UAM:	G	C	C	A	G	A	A	A	C	C	T

IGHV3-36

GENE ALIGN SEQ

HUM:	A	T	G	G	A	G	T	T	T	G	G	G	C	T	G	A	G	C	T	G	G	G	T	T	T	T	C	C	T	T	G	T	T	G	C	T	A	A	T	G	T	A	A	A	A	G	G	T	G	A	
UAM:	A	T	G	G	A	G	T	T	T	G	G	G	C	T	G	A	G	C	T	G	G	G	T	T	T	T	C	C	T	T	G	T	T	G	C	T	A	A	T	G	T	A	A	A	A	G	G	T	G	A	
HUM:	C	T	C	A	T	G	G	A	G	A	A	C	T	A	G	A	G	A	T	A	T	T	G	A	G	T	G	T	G	A	G	T	G	G	A	C	A	C	A	A	G	T	G	A	G	A	A	A			
UAM:	C	T	C	A	T	G	G	A	G	A	A	C	T	A	G	A	G	A	T	A	T	T	G	A	G	T	G	T	G	A	G	T	G	G	A	C	A	C	G	A	G	T	A	A	G	A	G	A	A	A	
HUM:	C	A	G	T	G	G	A	T	A	T	G	T	G	T	G	G	C	A	G	G	T	T	C	T	G	A	C	C	A	G	G	G	T	G	T	C	T	G	T	G	T	G	T	T	T	G	C	A			
UAM:	C	A	G	T	G	G	A	T	A	T	G	T	G	T	G	G	C	A	G	G	T	T	C	T	G	A	C	C	A	G	G	G	T	A	T	C	-	-	T	G	T	G	T	G	T	T	T	G	C	A	
HUM:	G	G	T	G	T	C	C	A	G	T	G	T	G	A	G	G	T	G	C	A	G	C	T	G	G	T	G	G	A	G	T	C	T	T	T	G	G	G	A	G	G	C	T	T	G	T	T	A	T	A	
UAM:	G	G	T	G	T	C	C	A	G	T	G	T	G	A	G	G	T	G	C	T	T	C	T	G	G	T	G	G	A	G	T	C	T	T	T	G	G	G	A	G	C	T	T	G	T	T	A	T	A		
HUM:	G	C	C	T	G	G	G	G	T	C	C	C	T	G	A	G	A	C	T	T	T	C	T	T	T	T	G	C	A	G	C	C	T	C	T	G	G	A	T	T	C	A	C	C	T	T	T	A	G		
UAM:	T	C	C	T	G	G	G	G	T	C	C	C	T	G	A	G	A	C	T	T	T	C	T	T	T	T	G	C	A	G	C	C	T	C	T	G	G	A	T	T	C	A	C	C	T	T	T	A	G		
HUM:	T	A	C	C	T	T	T	A	T	T	A	G	G	T	A	C	T	G	G	A	T	G	A	G	C	T	G	-	-	G	G	T	C	C	A	T	C	A	G	G	C	T	C	C	T	G	G	G	A	A	
UAM:	T	A	C	C	T	T	T	A	G	T	A	G	G	T	A	C	T	G	G	A	T	G	A	G	C	T	G	C	C	-	G	T	C	C	A	T	C	A	A	G	C	T	C	C	T	G	G	G	A	A	
HUM:	A	G	G	G	C	T	G	G	A	G	T	A	G	G	T	C	T	C	A	T	T	T	A	T	G	A	G	T	T	G	T	T	G	T	G	T	A	G	G	T	A	G	C	A	C	A	A	G	C	T	
UAM:	A	G	G	G	C	T	G	C	A	G	T	A	G	G	T	C	T	C	A	T	T	T	A	T	G	A	G	T	T	G	T	T	G	T	G	T	A	G	G	T	A	G	C	A	C	A	A	A	C	T	
HUM:	A	T	G	C	A	G	A	C	T	C	T	G	T	G	A	A	G	G	G	T	C	G	A	T	T	C	A	C	C	C	T	C	T	C	C	A	G	A	G	A	T	G	A	T	G	C	C	A	A	G	
UAM:	A	T	G	C	A	G	A	C	T	C	T	G	T	G	A	A	G	G	G	T	C	G	A	T	T	C	A	C	C	G	T	C	T	C	C	A	G	A	G	A	T	G	A	T	G	C	C	A	A	G	
HUM:	A	A	A	T	C	A	C	T	G	T	A	T	C	T	G	C	A	A	A	T	G	A	A	C	A	G	C	G	T	C	A	G	A	G	C	C	G	A	G	G	A	T	A	G	G	T	C	T	G	T	
UAM:	A	A	A	T	C	A	C	T	G	T	A	T	C	T	G	C	A	A	A	T	G	A	A	C	A	G	C	G	T	G	A	G	A	G	C	C	T	A	G	G	A	T	A	G	G	T	C	T	G	T	
HUM:	G	T	A	T	T	A	C	T	G	T	G	G	T	G	G																																				
UAM:	G	T	A	T	T	A	C	T	G	T	A	G	T	G	G																																				
D7																																																			
HUM:	C	A	T	T	G	T	G																																												
UAM:	C	A	T	T	C	T	G																																												
D9																																																			
HUM:	G	C	A	G	A	G	A	T	G	C	T																																								
UAM:	G	C	A	G	A	G	A	T	G	C	T																																								

IGHV3-35

GENE ALIGN SEQ

HUM:	A	T	G	G	A	A	T	T	T	G	G	G	C	T	G	A	G	C	T	G	G	G	T	T	T	T	T	C	T	T	G	C	T	G	C	T	A	T	T	T	T	A	A	A	A	G	G	T	G	A
UAM:	A	T	G	G	A	A	T	T	T	G	G	A	C	T	G	A	G	C	T	G	G	G	T	T	T	T	T	C	T	T	G	C	T	G	C	T	A	T	T	T	T	A	A	A	A	G	G	T	G	A
HUM:	T	T	C	A	T	G	A	A	G	A	A	C	T	A	A	G	G	A	T	A	T	T	G	A	-	-	G	T	G	A	G	T	G	G	A	C	A	T	G	A	G	T	G	A	G	A	G	A	A	A
UAM:	T	T	C	A	T	G	G	A	G	A	A	C	T	A	A	G	G	A	T	A	C	T	G	A	G	T	G	T	G	A	G	T	G	G	A	C	A	T	G	A	G	T	G	A	G	A	G	A	A	A
HUM:	C	A	G	T	G	G	A	T	T	T	G	T	G	T	G	G	C	A	G	T	T	T	C	T	G	A	C	C	A	G	G	G	T	G	T	C	T	C	T	G	T	G	T	T	T	G	C	A	G	G
UAM:	C	A	G	T	G	C	A	T	A	T	G	T	A	T	G	G	C	A	G	T	T	T	C	T	G	A	C	C	A	G	G	G	T	G	T	C	T	C	T	G	T	G	T	T	T	G	C	A	G	G
HUM:	T	G	T	C	C	A	G	T	G	T	G	A	G	G	T	G	C	A	G	C	T	G	G	T	G	G	A	G	T	C	T	G	G	G	G	A	G	G	C	T	T	G	G	T	A	C	A	G	C	
UAM:	T	G	T	C	C	A	G	T	G	C	G	A	G	G	T	G	C	A	G	C	T	G	G	T	G	G	A	G	T	C	T	G	G	G	G	A	G	G	C	T	T	G	G	T	A	C	A	G	C	
HUM:	C	T	G	G	G	G	A	T	C	C	C	T	G	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	G	A	T	T	C	A	C	C	T	T	C	A	G	T	
UAM:	C	T	G	G	G	A	G	A	T	C	C	C	T	G	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	G	A	T	T	C	A	C	C	T	T	C	A	G	T
HUM:	A	A	C	A	G	T	G	A	C	A	T	G	A	A	C	T	G	G	G	T	C	C	A	T	C	A	G	G	C	T	C	C	A	G	G	A	A	A	G	G	G	G	C	T	G	G	A	G	T	G
UAM:	A	A	C	A	C	T	G	A	C	A	T	G	A	A	C	T	G	G	G	T	C	C	G	C	C	A	G	G	C	T	C	C	A	G	G	A	A	A	G	G	G	G	C	T	G	G	A	G	T	G
HUM:	G	G	T	A	T	C	-	-	G	G	G	T	G	T	T	A	G	T	T	G	G	A	A	T	G	G	C	A	G	T	A	G	G	A	C	G	C	A	C	T	A	T	G	C	A	G	A	C	T	C
UAM:	G	G	T	-	-	C	T	T	G	G	G	T	A	T	T	A	G	T	T	G	G	A	A	T	G	G	T	G	G	T	A	G	G	A	T	G	C	A	C	T	A	T	G	C	G	G	A	C	T	C
HUM:	T	G	T	G	A	A	G	G	G	C	C	G	A	T	T	C	A	T	C	A	T	C	T	C	C	A	G	A	G	A	C	A	A	T	T	C	C	A	G	G	A	A	C	A	C	C	C	T	G	T
UAM:	C	G	T	G	A	A	G	G	G	C	C	G	A	T	T	C	A	T	C	A	T	C	T	C	C	A	G	A	G	A	C	A	A	T	T	C	C	A	G	G	A	A	C	A	C	C	T	G	T	
HUM:	A	T	C	T	G	C	A	A	A	C	G	A	A	T	A	G	C	C	T	G	A	G	G	G	C	C	G	A	G	G	A	C	A	C	G	G	C	T	G	T	G	T	A	T	T	A	C	T	G	T
UAM:	A	T	C	T	G	C	A	A	A	C	G	A	A	T	A	G	C	C	T	G	A	G	G	G	C	C	G	A	G	G	A	C	A	C	A	G	C	T	G	T	G	T	A	T	T	A	C	T	G	T
HUM:	G	T	G	A	G	A	A	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UAM:	G	T	G	A	G	A	A	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
D7	C	A	C	T	G	T	G	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
HUM:	C	A	C	T	G	T	G	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UAM:	C	A	C	T	G	T	G	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
D9	G	A	C	A	C	A	A	A	C	C	T	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
HUM:	G	A	C	A	C	A	A	A	C	C	T	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UAM:	G	A	C	A	C	A	A	A	C	C	T	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		

IGHV7-34-1

GENE ALIGN SEQ

HUM:	A	T	G	G	A	C	T	G	G	A	C	C	T	G	A	A	G	G	A	T	C	C	T	C	T	T	C	T	T	G	A	T	G	G	C	A	G	C	A	G	C	A	A	C	A	G	G	T	A	A
UAM:	A	T	G	G	A	C	T	G	G	A	C	C	T	G	G	A	G	G	A	T	C	C	T	C	T	T	C	T	T	G	A	T	G	G	C	A	G	C	A	G	C	A	A	C	A	G	G	T	A	A
HUM:	G	G	G	G	C	T	C	C	C	C	A	G	T	C	T	C	A	G	G	G	C	T	G	A	G	G	A	A	G	A	A	A	C	C	A	G	G	C	C	A	G	T	C	A	T	G	T	G	A	G
UAM:	G	G	G	G	C	T	C	C	C	C	A	G	T	C	T	C	A	G	G	G	A	T	G	A	G	G	A	A	G	A	A	A	C	C	A	G	G	C	C	A	G	T	C	A	T	G	T	G	A	C
HUM:	A	C	T	T	C	A	C	C	C	A	C	T	C	T	T	G	T	G	T	C	C	A	C	T	C	C	A	C	A	G	G	T	G	C	C	C	A	C	T	C	C	C	T	G	C	A	G	C	T	G
UAM:	A	C	T	T	C	A	C	C	C	A	C	T	C	C	T	G	T	G	T	C	C	A	C	T	C	C	A	C	A	G	G	T	G	C	C	C	A	C	T	C	C	C	T	G	C	A	G	C	T	G
HUM:	G	T	G	C	A	G	T	C	T	G	G	G	C	C	T	G	A	G	G	T	G	A	A	G	A	A	G	C	C	T	G	G	G	G	C	C	T	C	A	G	T	G	A	A	G	G	T	C	T	C
UAM:	G	T	G	C	A	G	T	C	T	G	G	G	C	C	T	G	A	G	G	T	G	A	A	G	A	A	G	C	C	T	G	G	G	G	C	C	T	C	A	G	T	G	A	A	G	G	T	C	T	C
HUM:	C	T	A	T	A	A	G	T	C	T	T	C	T	G	G	T	T	A	C	A	C	C	T	T	C	A	C	C	A	T	C	T	-	A	T	G	G	T	A	T	G	A	A	T	T	G	G	T	A	
UAM:	C	T	A	T	A	A	G	T	C	T	T	C	T	G	G	T	T	A	C	A	C	C	T	T	C	A	C	C	A	-	C	T	T	A	T	G	G	T	A	T	G	A	A	T	T	G	G	T	T	A
HUM:	T	G	A	T	A	G	A	C	C	C	C	T	G	G	A	C	A	G	G	G	C	T	T	T	G	A	G	T	G	G	A	T	G	T	G	A	T	G	G	A	T	C	A	T	C	A	C	C	T	A
UAM:	T	G	A	C	A	G	A	C	C	C	C	T	G	G	A	C	A	G	G	G	C	C	T	T	G	A	G	T	G	G	A	T	G	G	G	A	T	G	G	A	T	C	A	T	C	A	C	C	T	A
HUM:	C	A	C	T	G	G	G	A	A	C	C	C	A	A	C	G	-	-	-	T	A	T	A	C	C	C	A	C	G	G	C	T	T	C	A	C	A	G	G	A	T	G	G	T	T	T	G	T	C	T
UAM:	A	A	C	T	G	G	G	A	A	C	C	C	-	-	-	G	A	C	A	T	A	T	A	C	C	C	A	C	G	G	C	T	T	C	A	C	A	G	G	A	T	G	G	T	T	T	G	T	C	T
HUM:	T	C	T	C	C	A	T	G	G	A	C	A	C	G	T	C	T	G	T	C	A	G	C	A	C	G	G	C	G	T	G	T	C	T	T	C	A	G	A	T	C	A	G	C	A	G	C	C	T	A
UAM:	T	C	T	C	C	A	T	G	G	A	C	A	C	C	T	C	T	G	T	C	A	G	C	A	C	G	G	C	G	T	A	T	C	T	T	C	A	G	A	T	C	A	G	C	A	G	C	C	T	A
HUM:	A	A	G	G	C	T	G	A	G	G	A	C	A	C	G	G	C	C	G	A	G	T	A	T	T	A	C	T	G	T	G	C	G	A	A	G	T	A												
UAM:	A	A	G	G	C	T	G	A	G	G	A	C	A	C	G	G	C	T	G	A	G	T	A	T	T	A	C	T	G	T	G	C	G	A	A	G	T	A												

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	T	T	C	A	G	A	A	A	G	C	C
UAM:	T	T	C	A	G	A	A	A	G	C	C

IGHV4-34

GENE ALIGN SEQ

HUM:	A	T	G	A	A	A	C	A	C	C	T	G	T	G	G	T	T	C	T	T	C	C	T	C	C	T	C	C	T	G	G	T	G	G	C	A	G	C	T	C	C	C	A	G	A	T	G	T	G	A
UAM:	A	T	G	A	A	A	C	A	C	C	T	G	T	G	G	T	T	C	T	T	C	C	T	T	C	T	C	C	T	G	G	T	G	G	C	A	G	C	T	C	C	C	A	G	A	T	G	T	G	A
HUM:	G	T	G	T	C	T	C	A	G	G	A	A	T	G	C	G	G	A	T	A	T	G	A	A	G	A	T	A	T	G	A	G	A	T	G	C	T	G	C	C	T	C	T	G	A	T	C	C	C	A
UAM:	G	T	G	T	C	T	C	A	G	G	A	A	T	G	C	A	G	A	T	A	T	G	A	A	G	A	T	A	T	G	A	G	A	T	G	C	T	G	C	C	T	C	T	G	A	T	C	C	C	A
HUM:	G	G	G	C	T	C	A	C	T	G	T	G	G	G	T	T	T	C	T	C	T	G	T	T	C	A	C	A	G	G	G	G	T	C	C	T	G	T	C	C	C	A	G	G	T	G	C	A	G	C
UAM:	G	G	G	C	T	C	A	C	T	G	T	G	G	G	T	C	T	C	T	C	T	G	T	T	C	A	C	A	G	G	G	G	T	C	C	T	G	T	C	C	C	A	G	G	T	G	C	A	G	C
HUM:	T	A	C	A	G	C	A	G	T	G	G	G	G	C	G	C	A	G	G	A	C	T	G	T	T	G	A	A	G	C	C	T	T	C	G	G	A	G	A	C	C	C	T	G	T	C	C	C	T	C
UAM:	T	A	C	A	G	C	A	G	T	G	G	G	G	T	G	C	A	G	G	A	C	T	G	G	T	G	A	A	G	C	C	T	T	C	G	G	A	G	A	C	C	C	T	G	T	C	C	C	T	C
HUM:	A	C	C	T	G	C	G	C	T	G	T	C	T	A	T	G	G	T	G	G	G	T	C	C	T	T	C	A	G	T	G	G	T	T	A	C	T	-	-	A	C	T	G	G	A	G	C	T	G	G
UAM:	A	C	C	T	G	C	G	C	T	G	T	C	T	A	T	G	G	T	G	G	G	T	C	C	T	T	C	A	G	T	G	A	T	T	A	-	T	G	G	-	C	T	G	G	A	A	C	T	G	G
HUM:	A	T	C	C	G	C	C	A	G	C	C	C	C	C	A	G	G	G	A	A	G	G	G	G	C	T	G	G	A	G	T	G	G	A	T	T	G	G	G	G	A	A	A	T	-	C	A	A	T	C
UAM:	A	T	C	C	G	C	C	A	G	C	C	C	C	C	A	G	G	G	A	A	G	G	G	G	C	T	G	G	A	G	T	G	G	A	T	T	G	G	G	-	-	-	-	T	A	C	-	A	T	C
HUM:	-	-	-	-	-	A	T	A	G	T	G	G	A	A	G	C	A	C	C	A	A	C	T	A	C	A	A	C	C	C	G	T	C	C	C	T	C	A	A	G	A	G	T	C	G	A	G	T	C	A
UAM:	G	T	T	A	G	-	T	A	G	T	G	G	G	A	G	A	A	C	C	A	A	C	T	A	C	A	A	C	C	C	G	T	C	C	C	T	C	A	A	G	A	G	T	C	G	A	G	T	C	A
HUM:	C	C	A	T	A	T	C	A	G	T	A	G	A	C	A	C	G	T	C	C	A	A	G	A	A	C	C	A	G	T	T	C	T	C	C	C	T	G	A	A	G	C	T	G	A	G	C	T	C	T
UAM:	C	C	A	T	G	T	C	A	G	T	A	G	A	C	A	C	G	T	C	C	A	A	G	A	A	C	C	A	G	T	T	C	T	C	C	C	T	G	A	A	G	C	T	G	A	G	C	T	C	T
HUM:	G	T	G	A	C	C	G	C	C	G	C	G	G	A	C	A	C	G	G	C	T	G	T	G	T	A	T	T	A	C	T	G	T	G	C	G	A	G	A	G	G									
UAM:	G	T	G	A	C	C	G	C	C	G	C	G	G	A	C	A	C	G	G	C	C	G	T	G	T	A	T	T	A	C	T	G	T	G	C	G	A	G	A	G	G									

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	G	A	C	A	A	A	A	A	C	C	T
UAM:	G	A	T	A	A	A	A	A	C	C	T

IGHV3-33-2

GENE ALIGN SEQ

HUM:	A	T	G	G	A	G	C	T	T	G	G	G	C	T	G	A	G	C	T	G	G	G	T	T	T	T	C	A	C	T	G	T	T	G	C	T	G	T	T	T	T	A	A	A	A	G	G	T	G	A
UAM:	A	T	G	G	A	G	T	T	T	G	G	G	C	T	G	A	G	C	T	G	G	G	T	T	T	T	C	A	C	T	G	T	T	G	C	T	G	T	T	T	T	A	A	A	A	G	G	T	G	A
HUM:	A	C	T	A	G	A	G	A	G	A	T	T	G	A	G	C	G	T	G	A	G	T	G	G	A	T	A	C	C	C	T	T	G	A	G	A	G	A	A	A	T	G	G	T	G	G	A	T	T	A
UAM:	A	C	T	A	G	A	G	A	G	A	T	T	G	A	G	T	G	T	G	A	G	T	G	G	A	T	A	C	A	C	T	T	G	A	G	A	G	A	A	A	C	A	G	T	G	G	A	T	T	A
HUM:	T	G	T	C	T	G	G	G	A	G	T	T	T	C	T	G	A	C	C	A	G	G	A	T	G	T	C	T	A	C	G	A	G	T	T	T	G	C	A	G	G	T	G	T	C	T	A	G	T	G
UAM:	T	G	T	C	A	G	G	G	A	G	T	T	T	C	T	G	A	A	C	A	G	G	A	T	G	T	C	T	A	T	G	A	G	T	T	T	G	C	A	G	G	T	G	T	C	C	A	G	T	G
HUM:	A	G	A	G	G	T	A	C	A	G	C	T	C	G	T	G	G	A	G	T	C	C	G	G	A	G	A	G	G	A	C	C	C	A	A	G	A	C	A	A	C	C	T	G	G	G	G	G	A	T
UAM:	T	G	A	G	G	T	A	C	A	G	C	T	A	G	T	G	G	A	G	T	C	C	G	G	A	G	A	G	G	A	C	C	C	A	A	G	A	C	A	A	C	C	T	G	G	G	G	G	T	
HUM:	C	C	T	T	G	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	A	C	T	C	T	G	G	A	T	T	A	A	C	C	T	T	C	A	G	T	A	G	C	T	A	C	T	G	A
UAM:	C	C	G	T	G	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	A	C	T	C	T	G	G	A	T	T	A	A	C	C	T	T	C	A	G	T	A	G	C	T	A	C	T	G	A
HUM:	A	T	G	A	G	C	T	C	G	G	T	T	T	C	C	C	A	G	G	C	T	C	C	A	G	G	A	A	G	G	G	G	C	T	G	G	A	G	T	G	A	G	T	A	G	T	A	G	A	
UAM:	A	T	G	A	G	C	T	C	A	G	T	T	T	C	C	C	A	G	G	C	T	C	C	A	G	G	A	A	G	G	G	G	C	T	G	G	A	G	T	G	A	G	T	A	G	T	A	G	A	
HUM:	T	A	-	-	T	A	C	A	G	T	G	T	G	A	T	G	G	A	A	G	T	C	A	G	A	T	A	T	G	T	T	A	T	G	C	C	C	A	A	T	C	T	G	T	G	A	A	G	A	G
UAM:	T	A	A	A	T	-	-	A	G	T	A	C	G	A	T	A	C	A	A	G	T	C	A	G	A	T	A	T	G	T	T	A	T	G	C	A	C	A	A	A	C	T	G	T	G	A	A	G	A	G
HUM:	C	A	A	A	T	T	C	A	C	C	A	T	C	T	C	C	A	A	A	G	A	A	A	A	T	G	C	C	A	A	G	A	A	C	T	C	A	C	T	G	T	A	T	T	T	G	C	A	A	A
UAM:	C	A	G	A	T	T	C	A	C	C	A	T	C	T	C	C	A	A	A	G	A	A	A	A	T	G	C	C	A	A	G	A	A	C	T	C	A	C	T	C	C	A	T	T	T	G	C	A	A	A
HUM:	T	G	A	A	C	A	G	T	C	T	G	A	G	A	G	C	A	G	A	G	G	G	C	A	C	A	G	C	T	G	T	G	T	G	T	T	A	C	T	G	T	A	T	G	T	G	A	G	G	C
UAM:	T	G	A	A	C	G	G	T	C	T	G	A	G	A	A	C	A	G	A	G	G	G	C	A	C	A	A	C	T	G	T	G	T	G	T	T	A	C	T	G	T	A	T	G	T	G	A	G	G	C
HUM:	A																																																	
UAM:	A																																																	

D7

HUM:	C	C	A	G	G	T	A
UAM:	C	C	A	G	G	T	A

D9

HUM:	G	A	C	A	C	A	G	T	T	T	C
UAM:	G	A	C	A	C	A	G	A	A	T	T

IGHVII-33-1

GENE ALIGN SEQ

HUM:	G	G	C	C	T	G	G	T	G	A	A	G	C	C	T	T	C	A	C	A	G	A	A	C	C	-	T	C	T	C	C	C	T	C	A	C	C	T	G	T	G	C	C	A	T	C	T	C	T	G	
UAM:	G	G	C	C	T	G	G	T	G	A	A	G	C	C	C	T	C	A	C	A	G	A	-	C	C	G	T	C	T	C	C	C	T	C	A	C	C	T	G	T	G	C	C	A	T	C	T	C	T	G	
HUM:	C	A	T	T	C	T	C	C	A	T	C	A	C	A	A	C	C	A	G	T	G	T	T	T	C	C	T	T	C	T	G	G	A	G	C	T	G	C	A	T	C	C	A	T	-	C	A	G	C	G	
UAM:	C	A	T	T	C	T	C	C	A	T	C	A	C	A	A	C	C	A	G	T	G	T	T	T	C	C	T	G	C	T	G	G	A	G	C	T	G	C	A	T	C	C	-	T	G	C	A	G	C	G	
HUM:	C	C	C	C	C	A	T	G	G	G	A	G	G	T	A	C	T	G	G	A	G	T	G	G	A	T	C	G	G	G	T	G	C	A	T	A	G	G	T	C	A	T	G	G	A	G	G	G	A	G	
UAM:	C	C	C	C	C	-	A	C	G	G	G	A	G	G	T	A	C	T	G	G	A	G	T	G	G	A	T	C	G	G	G	T	G	C	A	T	A	G	G	T	C	A	C	G	G	A	G	G	G	A	G
HUM:	C	A	C	A	G	A	T	T	A	C	T	C	C	C	C	T	C	T	T	C	T	C	A	A	G	A	G	T	C	C	A	G	T	C	A	C	C	A	T	C	T	C	C	A	G	A	T	C	C	A	
UAM:	C	A	C	A	G	A	T	T	A	C	T	C	C	C	G	T	C	T	T	C	T	C	A	A	G	A	G	T	C	C	A	G	T	C	A	C	C	A	T	C	T	C	C	A	G	A	T	C	C	A	
HUM:	T	G	T	C	C	A	A	A	A	A	G	T	A	C	T	T	C	T	T	C	T	T	A	C	A	G	G	T	G	A	A	C	T	A	T	G	T	G	A	G	C	A	A	C	A	A	A	C	A	C	
UAM:	T	G	T	C	C	A	A	A	A	A	G	T	A	G	T	T	C	C	T	C	T	T	A	C	A	G	C	T	G	A	A	C	T	A	T	G	T	G	A	G	C	A	A	C	A	A	A	C	A	C	
HUM:	A	T	A	G	C	C	A	-	T	G	T	A	T	T	T	T	A	G	A	G	C	A	A	A	A	G	A																								
UAM:	A	T	A	G	C	C	A	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			

D7

HUM:	C	A	C	A	G	T	G
UAM:	G	T	A	G	T	T	T

D9

HUM:	T	A	C	C	C	A	A	G	C	C	T
UAM:	A	A	C	C	A	C	A	G	T	G	T

IGHVII-30-21

GENE ALIGN SEQ

HUM: T C A C A G A C C C T C T C C C T C A C C T G C A C T G T C T C T G G A T T C C C C A T C A T A A C
UAM: T C G C A G A C C C T C T C C C T C A C C T G C A C T G T C T C T G G A T T C C C C A T C A T A A C

HUM: C A G T G T T T C C T T C T A G A A T T G T A T C T G C T T G C C C C T A G A A G A T G G A C A G G
UAM: C A G T G T T T C C C A C T A G A A T T G T A T C T G C T T G T C C C T A G A A G A T G G A C A G G

HUM: A G T G G A T C A G G T G C A T G G G T T G T G A A G G G A G C A C A A A T T A C A A C C C A C T T
UAM: A G T G G A T C A G G T G C A T G G G T T G T G A A G G G A G C A C A A A T T A C A A C C C - A C T T

HUM: C T C A A G A G T C C A T A T C C G G A T C C A A G A A A C A G T T C T T A C A G C T G A G C T C T
UAM: C T C A A G A G T C C A T - - - - - A T C C A A G A A A C A G T T C T T A C A G C T G A G C T C T

HUM: G T G C C C A G T G A A C A C A C A A C T A C G C A T T T T G A A G C A A A A G A T G C A A T G A -
UAM: G T G C C C A G T G A A C A C A C A A C T A T G C A T T T T T A A G C A A A A G A G G C A A T G A G

HUM: A G G - G C C T T
UAM: A G G A - - C T T

D7

HUM: C A T T G T G
UAM: C A T T A T G

D9

HUM: C A G G G G T G A A T
UAM: C A G G G G T G C A T

IGHV4-28

GENE ALIGN SEQ

HUM:	A	T	G	A	A	A	C	A	C	C	T	G	T	G	G	T	T	C	T	T	C	C	T	C	C	T	G	C	T	G	G	T	G	G	C	A	G	C	T	C	C	C	A	G	A	T	G	T	G	A
UAM:	A	T	G	A	A	A	C	A	C	C	T	G	T	G	G	T	T	C	T	T	C	C	T	C	C	T	G	C	T	G	G	T	G	G	C	A	G	C	T	C	C	C	A	G	A	T	G	T	G	A
HUM:	G	T	G	T	C	T	C	A	A	G	G	C	T	G	C	A	G	A	C	A	T	G	G	A	G	A	T	A	T	G	G	G	A	G	G	-	T	G	C	C	T	C	T	G	A	G	C	C	C	A
UAM:	G	T	G	T	C	T	C	A	A	G	G	C	T	G	C	A	G	A	C	A	T	G	G	A	G	A	T	A	T	G	G	G	A	G	G	C	T	G	C	C	T	C	T	G	A	T	C	C	C	A
HUM:	G	G	G	C	T	C	A	C	T	G	T	G	G	G	T	C	T	C	T	C	T	G	T	T	C	A	C	A	G	G	G	G	T	C	C	T	G	T	C	C	C	A	G	G	T	A	C	A	G	C
UAM:	G	G	G	C	T	C	A	C	T	G	T	G	G	G	T	C	T	C	T	C	T	G	T	T	C	A	C	A	G	G	G	G	T	C	C	T	G	T	C	C	C	A	G	G	T	G	C	A	G	C
HUM:	T	G	C	A	G	G	A	G	T	C	G	G	G	C	C	C	A	G	G	A	C	T	G	G	T	G	A	A	G	C	C	T	T	C	G	G	A	C	A	C	C	C	T	G	T	C	C	C	T	C
UAM:	T	G	C	A	G	G	A	G	T	C	G	G	G	C	C	C	A	G	G	A	C	T	G	G	T	G	A	A	G	C	C	T	T	C	G	G	A	G	A	C	C	C	T	G	T	C	C	C	T	C
HUM:	A	C	C	T	G	C	G	C	T	G	T	C	T	C	T	G	G	T	T	A	C	T	C	C	A	T	C	A	G	C	A	G	T	A	G	T	A	A	C	T	G	G	T	G	G	G	G	C	T	G
UAM:	A	C	C	T	G	C	G	C	T	G	T	C	T	C	T	G	G	T	G	G	C	T	C	C	A	T	C	A	G	C	A	G	T	G	G	T	T	A	C	T	A	C	T	G	G	G	G	C	T	G
HUM:	G	A	T	C	C	G	G	C	A	G	C	C	C	C	C	A	G	G	G	A	A	G	G	G	A	C	T	G	G	A	G	T	G	G	A	T	T	G	G	G	-	-	T	A	C	A	T	C	T	A
UAM:	G	A	T	C	C	G	C	C	A	G	C	C	C	C	C	A	G	G	G	A	A	G	G	G	C	C	T	G	G	A	G	T	G	G	A	T	T	G	G	G	C	A	T	A	-	-	T	C	A	A
HUM:	T	T	A	T	A	G	T	G	G	G	A	G	C	A	C	C	T	A	-	C	T	A	C	A	A	C	C	C	G	T	C	C	C	T	C	A	A	G	A	G	T	C	G	A	G	T	C	A	C	C
UAM:	T	T	A	T	G	G	T	G	G	G	A	G	C	A	C	C	-	A	G	C	T	A	C	A	A	C	C	C	A	T	C	C	C	T	C	A	A	G	A	G	T	C	G	A	G	T	C	A	C	C
HUM:	A	T	G	T	C	A	G	T	A	G	A	C	A	C	G	T	C	C	A	A	G	A	A	C	C	A	G	T	T	C	T	C	C	C	T	G	A	A	G	C	T	G	A	G	C	T	C	T	G	T
UAM:	T	T	G	T	C	A	G	T	A	G	A	C	A	C	G	T	C	C	A	A	G	A	A	C	C	A	G	T	T	C	T	C	C	C	T	G	A	A	G	C	T	G	A	G	C	T	C	T	G	T
HUM:	G	A	C	C	G	C	C	G	T	G	G	A	C	A	C	G	G	C	C	G	T	G	T	A	T	T	A	C	T	G	T	G	C	G	A	G	A	A	A											
UAM:	G	A	C	C	G	C	C	G	C	G	G	A	C	A	C	G	G	C	C	G	T	G	T	A	T	T	A	C	T	G	T	G	C	G	A	G	A	G	A											

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	A	T	G

D9

HUM:	G	A	C	A	C	A	A	A	C	C	T
UAM:	G	A	C	A	A	A	A	A	C	C	T

IGHV7-27

GENE ALIGN SEQ

HUM:	A	T	G	T	A	C	T	G	G	A	C	C	T	G	G	A	G	G	A	T	C	C	T	C	T	T	C	T	T	G	G	T	G	G	C	A	G	C	A	A	C	A	G	G	T	A	A				
UAM:	A	T	G	G	A	C	T	G	G	A	C	C	T	G	G	A	G	G	A	T	C	C	T	C	T	T	C	T	T	G	G	T	G	G	C	A	G	C	A	G	C	A	A	C	A	G	G	T	A	A	
HUM:	G	-	-	-	G	-	-	-	-	-	G	A	C	C	T	C	C	C	A	G	-	-	T	C	A	C	C	G	G	G	C	T	G	A	G	A	G	-	A	G	A	A	A	C	C	A	G	G	C		
UAM:	G	A	A	A	G	T	C	C	C	C	A	G	-	-	-	T	C	C	C	A	G	G	C	-	-	-	-	-	-	-	-	C	T	G	A	G	-	G	A	A	G	A	A	A	C	C	G	G	G	C	
HUM:	C	A	G	T	C	A	A	G	T	G	A	G	A	C	T	T	C	A	-	-	C	G	C	A	C	T	C	C	T	G	T	C	T	C	C	T	C	T	C	C	A	C	A	G	G	T	G	T	C	C	
UAM:	C	A	G	T	C	A	A	G	T	G	A	G	A	C	T	T	C	A	T	G	C	G	C	-	-	T	C	C	T	G	T	G	T	C	C	T	C	T	C	C	A	C	A	G	G	T	G	-	-	-	
HUM:	A	C	T	C	A	C	-	-	-	-	A	G	G	T	G	C	A	G	C	T	G	G	T	G	C	A	G	T	C	T	G	G	G	C	C	T	G	A	G	G	T	G	A	A	G	A	A	G	C	C	
UAM:	-	C	T	C	A	C	T	C	C	C	A	G	G	T	G	C	A	G	C	T	G	G	T	G	C	A	G	T	C	T	G	A	G	C	C	T	G	A	G	A	T	G	A	A	G	C	A	G	C	C	
HUM:	T	G	G	A	G	C	C	T	C	A	T	T	G	A	A	G	G	T	T	-	T	C	C	T	G	C	A	A	G	G	C	T	T	C	T	G	G	A	T	A	C	A	C	C	T	T	C	A	C	A	
UAM:	T	G	G	G	G	C	C	T	C	A	G	T	G	A	A	G	-	T	T	C	T	C	C	T	G	C	A	A	G	G	C	T	A	C	T	G	G	T	T	A	C	A	C	C	T	T	C	A	C	T	
HUM:	A	G	C	T	A	T	G	C	T	A	T	C	A	G	-	-	C	T	G	G	G	T	A	T	G	A	C	A	G	G	C	C	C	A	T	G	G	A	C	A	A	G	G	G	C	T	T	G	A	G	
UAM:	A	G	C	T	A	T	G	T	T	A	T	-	-	G	A	A	C	T	G	G	G	T	G	C	G	A	C	A	G	G	C	C	C	C	T	G	G	A	C	A	A	G	G	G	C	T	T	G	A	G	
HUM:	G	A	A	A	T	G	G	G	A	T	G	G	A	T	C	A	A	C	A	C	C	A	A	C	A	C	T	G	G	G	A	A	C	C	T	A	A	C	G	T	A	T	G	C	C	C	A	G	G	G	
UAM:	T	G	G	G	T	G	G	G	A	T	G	G	A	T	C	A	A	C	A	C	C	A	A	C	A	C	T	G	G	G	A	A	C	C	C	A	A	T	G	T	A	T	G	C	C	C	A	G	G	G	
HUM:	C	T	T	C	A	C	A	G	G	A	C	A	G	G	T	T	T	G	T	C	T	T	C	T	C	C	A	T	G	G	A	C	A	C	C	T	C	C	G	T	C	A	G	C	A	T	G	-	-	-	G
UAM:	C	T	T	C	A	C	A	G	G	A	C	A	G	T	T	T	G	T	C	T	T	C	T	C	C	A	T	G	G	A	C	A	C	C	T	C	-	-	-	-	-	-	-	-	-	T	G	T	C	A	G
HUM:	-	-	C	-	-	-	A	T	A	T	C	T	T	C	A	T	A	T	C	A	G	C	A	G	C	C	T	A	A	A	G	G	C	T	G	A	G	G	A	C	A	-	-	-	-	-	C	G			
UAM:	T	A	C	A	G	T	A	T	A	T	C	T	G	C	A	G	A	T	C	A	G	T	A	G	C	C	T	A	A	A	G	G	C	T	G	A	G	G	A	C	A	T	G	G	C	T	-	G			

D7

HUM:	T	G	C	A	A	G	A
UAM:	T	G	T	A	T	T	A

D9

HUM:	C	C	T	G	A	G	A	G	A	A	C
UAM:	A	A	A	C	C	C	A	C	A	T	C

IGHVIII-26-1

GENE ALIGN SEQ

HUM:	A	A	G	T	C	C	T	G	T	G	T	G	A	T	G	T	T	T	A	C	T	G	A	T	G	G	A	G	T	C	A	G	A	A	G	G	A	G	A	A	A	A	T	T	-	T	A	A	C	
UAM:	A	A	G	T	C	C	T	G	T	G	T	G	A	T	G	T	T	T	A	C	T	G	A	T	G	G	A	G	T	C	A	G	A	A	G	G	G	G	A	A	A	A	T	T	G	T	-	A	C	
HUM:	A	G	C	C	C	A	G	C	A	G	T	T	C	A	C	T	G	A	G	A	C	T	G	T	C	C	T	G	C	A	A	A	G	C	C	T	C	T	G	G	T	T	T	C	G	G	G	T	T	T
UAM:	A	G	C	C	C	A	G	C	G	G	T	T	C	A	C	T	G	A	G	A	C	T	G	T	C	C	T	G	C	A	A	A	A	C	C	T	C	T	G	G	T	T	T	C	G	G	G	T	T	T
HUM:	A	C	T	G	G	G	T	G	C	A	G	C	A	T	G	A	G	C	T	T	G	G	T	C	C	A	G	C	-	A	C	A	C	T	-	-	-	T	C	A	C	A	A	C	A	G	G	A	A	T
UAM:	A	C	T	G	G	G	T	A	C	A	G	C	A	T	G	A	G	C	T	T	G	G	T	C	C	A	G	C	G	-	-	-	-	T	G	C	G	T	C	A	C	A	A	C	A	G	G	A	A	T
HUM:	T	G	G	T	G	T	G	G	T	A	G	C	A	A	C	A	G	T	G	A	G	A	G	A	T	C	A	T	A	T	G	G	G	A	G	T	T	C	T	A	A	G	G	G	T	T	A	C	T	
UAM:	T	G	G	T	G	T	G	G	A	T	A	G	C	A	A	C	G	G	T	G	A	G	A	G	A	T	C	A	T	A	T	G	G	G	A	G	T	T	C	T	C	A	G	G	G	T	T	A	C	T
HUM:	C	T	C	C	A	T	G	A	G	T	A	C	A	G	A	T	A	A	A	T	C	A	A	C	A	T	T	C	C	C	A	A	G	T	G	A	C	A	C	C	C	T	T	T	C	A	A	G	T	G
UAM:	C	T	C	C	A	T	G	A	G	T	A	C	A	A	A	T	A	A	G	T	T	A	A	C	A	T	T	C	C	C	A	A	G	C	G	A	C	A	C	C	C	T	T	T	C	A	A	G	T	G
HUM:	C	A	G	T	C	T	A	C	C	T	T	A	C	A	A	G	G	A	C	C	A	A	C	C	T	G	A	A	A	G	C	C	A	A	G	G	G	C	A	A	G	G	C	C	G	T	A	T	A	T
UAM:	C	A	G	T	C	T	A	C	C	T	T	A	C	A	A	T	G	A	C	C	A	A	C	C	T	G	A	A	A	G	C	C	A	A	G	G	G	C	A	A	G	G	C	C	G	T	G	T	A	T
HUM:	T	A	C	A	G	T	G	A	G	G	G	A																																						
UAM:	C	A	C	A	G	T	G	A	G	G	G	A																																						
D7																																																		
HUM:	C	A	C	A	G	G	G																																											
UAM:	C	A	C	A	G	G	A																																											
D9																																																		
HUM:	A	G	A	C	A	C	A	A	A	A	A																																							
UAM:	A	G	A	C	A	C	A	A	A	A	A																																							

IGHV2-26

GENE ALIGN SEQ

HUM:	A	T	G	G	A	C	A	C	A	C	T	T	T	G	C	T	A	C	A	C	A	C	T	C	C	T	G	C	T	G	C	T	G	A	C	C	A	C	C	C	C	T	T	C	C	T	G	T	G	A
UAM:	A	T	G	G	A	C	A	C	G	C	T	T	T	G	C	T	A	C	A	C	A	C	T	C	C	T	G	C	T	G	C	T	G	A	C	C	A	C	C	C	C	T	T	C	C	T	G	T	G	A
HUM:	G	T	G	C	T	G	T	G	G	T	C	A	G	G	G	A	C	T	T	C	C	T	C	A	G	A	A	G	T	G	A	A	A	C	A	T	C	A	G	T	T	G	T	C	T	C	C	T	T	T
UAM:	G	T	G	C	T	G	T	G	G	T	C	A	G	G	G	A	G	T	T	C	C	T	C	A	G	A	A	G	T	G	A	A	A	C	A	T	C	A	G	T	T	C	T	C	T	C	C	T	T	T
HUM:	G	T	G	G	G	C	T	T	C	A	T	C	T	T	C	T	T	A	T	G	T	C	T	T	C	T	C	C	A	C	A	G	G	G	G	T	C	T	T	G	T	C	C	C	A	G	G	T	C	A
UAM:	G	T	G	G	G	C	T	T	C	A	T	C	T	T	C	T	T	A	T	G	T	C	T	T	C	T	C	C	A	C	A	G	G	G	G	T	C	T	T	G	T	C	C	C	A	G	G	T	C	A
HUM:	C	C	T	T	G	A	A	G	G	A	G	T	C	T	G	G	T	C	C	T	G	T	G	C	T	G	G	T	G	A	A	A	C	C	C	A	C	A	G	A	G	A	C	C	C	T	C	A	C	G
UAM:	C	C	T	T	G	A	A	G	G	A	G	T	C	T	G	G	T	C	C	T	G	C	G	C	T	G	G	T	G	A	A	A	C	C	C	A	C	A	G	A	G	A	C	C	C	T	C	A	C	G
HUM:	C	T	G	A	C	C	T	G	C	A	C	C	G	T	C	T	C	T	G	G	G	T	T	C	T	C	A	C	T	C	A	G	C	A	A	T	G	C	T	A	G	A	A	T	G	G	G	T	G	T
UAM:	C	T	G	A	C	C	T	G	C	A	C	C	G	T	C	T	C	T	G	G	G	T	T	C	T	C	A	C	T	C	A	G	C	A	A	T	T	C	T	A	A	A	A	T	G	G	G	T	G	T
HUM:	G	A	G	C	T	G	G	A	T	C	C	G	T	C	A	G	C	C	C	C	C	A	G	G	G	A	A	G	G	C	C	C	T	G	G	A	G	T	G	G	C	T	T	G	C	A	C	A	C	A
UAM:	G	A	G	C	T	G	G	A	T	C	C	G	T	C	A	G	C	C	C	C	C	A	G	G	G	A	A	G	G	C	C	C	T	G	G	A	G	T	G	G	C	T	T	G	C	A	C	A	C	A
HUM:	T	T	T	T	T	T	C	G	A	A	T	G	A	C	G	A	A	A	A	A	T	C	C	T	A	C	A	G	C	A	C	A	T	C	T	C	T	G	A	A	G	A	G	C	A	G	G	C	T	C
UAM:	T	T	T	T	T	T	C	G	A	A	T	G	A	C	G	A	A	A	A	A	T	C	C	T	A	C	A	G	C	A	C	A	T	C	T	C	T	G	A	A	G	A	G	C	A	G	G	C	T	C
HUM:	A	C	C	A	T	C	T	C	C	A	A	G	G	A	C	A	C	C	T	C	C	A	A	A	A	G	C	C	A	G	G	T	G	G	T	C	C	T	T	A	C	C	A	T	G	A	C	C	A	A
UAM:	A	C	C	A	T	C	T	C	C	A	A	G	G	A	C	A	C	C	T	C	C	A	A	A	A	G	C	C	A	G	G	T	G	G	T	C	C	T	T	A	C	C	A	T	G	A	C	C	A	A
HUM:	C	A	T	G	G	A	C	C	C	T	G	T	G	G	A	C	A	C	A	G	C	C	A	C	A	T	A	T	T	A	C	T	G	T	G	C	-	-	A	C	G	G	A	T	A	C				
UAM:	C	A	T	G	G	A	C	C	C	T	G	T	G	G	A	C	A	C	A	G	C	C	A	C	G	T	A	T	T	A	C	T	-	-	G	C	A	C	A	C	G	G	A	G	A	G				

D7

HUM:	C	A	C	A	G	A	G
UAM:	C	A	C	A	G	A	G

D9

HUM:	T	A	C	A	A	G	A	A	C	C	T
UAM:	T	A	C	A	A	G	A	A	C	C	C

IGHVIII-25-1

GENE ALIGN SEQ

HUM:	A	A	G	T	C	C	T	G	T	G	T	G	A	A	G	T	T	C	A	C	-	-	-	C	G	G	G	G	A	G	A	C	A	G	A	G	G	A	A	A	T	A	A	C	G	G	T	G	C	
UAM:	A	A	G	T	C	C	T	G	T	G	T	G	A	A	G	T	T	C	A	C	T	G	G	C	-	-	-	G	G	A	G	A	C	A	G	A	G	G	A	A	A	T	A	A	T	G	G	T	A	C
HUM:	A	G	C	C	G	G	G	G	G	C	T	A	T	C	T	G	A	G	T	C	T	C	T	C	C	T	G	C	A	A	A	G	A	C	T	C	T	G	G	A	T	T	C	A	C	C	T	T	C	A
UAM:	A	G	C	T	G	G	G	G	G	C	T	A	T	C	T	G	A	G	T	C	T	C	T	C	C	T	G	C	A	A	A	G	A	C	G	C	T	G	G	A	T	T	C	A	C	C	T	T	C	A
HUM:	C	T	G	A	T	T	G	C	A	G	C	A	T	A	A	G	C	T	T	G	G	T	C	C	A	G	C	A	A	G	C	T	C	C	A	G	G	A	C	C	A	G	G	G	T	T	G	A	T	G
UAM:	C	T	G	A	T	T	G	C	A	G	C	C	T	A	A	G	C	T	T	G	G	T	C	C	A	G	C	A	G	G	C	T	T	C	A	G	G	A	C	C	A	G	G	G	T	T	G	A	T	G
HUM:	T	G	G	G	C	A	G	C	A	A	C	A	G	G	G	A	G	A	A	A	T	T	G	A	A	G	A	G	G	A	A	G	C	T	C	T	C	A	G	T	G	G	T	G	C	C	C	T	C	C
UAM:	T	A	G	G	C	A	G	C	A	A	C	G	G	G	G	A	G	A	A	A	T	T	G	A	A	G	A	-	-	-	A	G	T	T	C	C	C	A	G	T	G	G	T	G	C	C	C	T	C	C
HUM:	A	T	G	A	A	T	A	C	A	A	A	G	A	A	T	C	T	T	C	A	C	A	G	T	C	C	C	C	A	G	G	A	C	A	C	C	C	T	T	A	C	G	T	G	C					
UAM:	A	T	G	A	A	T	A	C	A	A	A	G	A	A	T	C	T	T	C	A	C	A	G	T	C	C	C	C	A	G	G	A	C	A	C	C	C	T	T	A	C	T	T	G	C					

D7

HUM:	A	T	G	G	T	C	T
UAM:	A	T	G	G	T	C	T

D9

HUM:	A	T	C	A	C	T	T	T	T	G	T
UAM:	A	T	C	A	C	T	T	T	T	G	T

IGHV3-25

GENE ALIGN SEQ

HUM:	A	T	G	G	A	G	T	T	T	G	T	G	C	T	G	A	G	C	T	G	G	G	T	T	T	T	C	C	T	T	G	T	T	G	C	T	A	T	T	T	T	A	A	A	A	C	G	T	G	A
UAM:	A	T	G	G	A	G	T	T	T	G	T	G	C	T	G	A	G	C	T	G	G	G	T	T	T	T	C	C	T	T	G	C	T	G	C	T	A	T	T	T	T	A	A	A	A	G	G	T	G	A
HUM:	T	C	T	A	T	A	G	A	G	A	A	C	T	A	G	A	G	A	T	A	T	T	G	A	G	T	-	A	T	G	A	A	T	G	G	A	T	A	T	G	A	G	T	-	-	-	-	-	-	
UAM:	T	C	T	A	T	A	G	A	G	A	A	C	T	A	G	A	G	A	T	G	T	T	G	A	G	T	G	-	-	-	-	-	-	-	-	-	-	-	T	G	A	G	T	G	G	A	C	A	C	A
HUM:	-	-	-	-	-	G	A	G	A	A	A	C	A	G	T	G	G	A	T	A	C	G	T	G	T	G	G	C	A	G	T	T	T	C	T	G	A	C	C	G	G	G	G	T	G	T	C	T	C	T
UAM:	A	G	T	G	A	G	A	G	A	A	A	C	A	G	T	G	G	A	T	A	T	G	T	G	T	G	G	C	A	G	T	T	T	C	T	C	A	C	T	G	G	G	G	T	G	T	C	T	C	T
HUM:	G	T	G	T	T	T	G	C	A	G	G	T	A	T	C	C	A	G	T	G	T	G	A	G	A	-	T	G	C	A	G	C	T	G	G	T	G	G	A	G	T	C	-	T	G	G	G	G	-	G
UAM:	G	T	G	T	T	T	G	C	A	G	G	T	A	T	C	C	A	G	T	G	T	G	A	-	A	G	T	G	T	A	G	C	T	G	G	T	G	G	A	G	A	C	C	-	-	G	G	G	C	G
HUM:	A	G	G	C	T	T	G	G	C	A	A	A	G	C	C	T	G	C	G	T	G	G	T	C	C	C	C	G	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	C
UAM:	A	G	G	C	T	T	G	G	C	A	A	A	G	C	C	T	G	G	G	T	G	G	T	C	C	C	C	G	A	G	A	C	T	C	T	C	C	T	G	T	G	C	C	G	C	C	T	C	T	C
HUM:	A	A	T	T	C	A	C	C	T	T	C	A	G	T	A	G	C	T	A	C	T	A	C	A	T	G	A	A	C	T	G	T	G	T	C	C	G	C	C	A	G	G	C	T	C	C	A	G	G	G
UAM:	G	A	T	T	C	A	C	C	T	T	C	A	G	T	A	G	C	T	A	C	T	A	C	A	T	G	A	A	C	T	G	T	G	T	C	T	G	C	C	A	G	G	C	T	C	C	A	G	G	G
HUM:	A	A	T	G	G	G	C	T	G	G	A	G	T	T	G	G	T	T	T	G	A	C	A	A	G	T	T	A	A	T	C	C	T	A	A	T	G	G	G	G	G	T	A	G	C	A	C	A	T	A
UAM:	A	A	T	A	G	G	C	T	G	G	A	G	T	T	G	G	T	T	G	G	A	C	A	A	G	T	T	A	A	T	C	C	T	A	A	T	G	G	G	G	G	T	A	G	C	A	C	A	T	A
HUM:	C	C	T	C	A	T	A	G	A	C	T	C	C	G	G	T	-	A	A	G	G	A	-	-	-	-	C	C	G	A	T	T	C	A	A	T	A	C	C	T	C	C	A	G	A	G	A	T	A	A
UAM:	C	C	T	C	A	T	A	G	A	C	T	C	-	-	-	T	G	-	-	G	G	A	A	G	G	G	C	C	A	A	T	T	C	A	C	T	A	C	C	T	C	C	A	G	A	G	A	T	A	A
HUM:	C	G	C	C	A	A	G	A	A	C	A	C	A	C	T	T	C	A	T	C	T	G	C	A	A	A	T	G	A	A	C	A	G	C	C	T	G	A	A	A	A	C	C	G	A	G	G	A	C	A
UAM:	C	G	C	C	A	A	G	A	A	C	A	C	T	C	T	T	C	A	T	C	T	G	C	A	A	A	T	G	A	A	C	A	A	C	C	T	G	A	A	A	A	C	C	G	A	G	G	A	C	A
HUM:	C	G	G	C	C	C	T	C	T	A	T	T	A	G	T	G	T	A	C	C	A	G	A	G	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UAM:	T	G	G	C	C	C	T	G	T	A	T	T	A	G	T	G	T	A	C	T	A	G	A	G	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	G	A	C	A	C	A	A	A	C	C	T
UAM:	G	A	C	A	C	A	A	A	C	C	T

IGHV1-24

GENE ALIGN SEQ

HUM:	A	T	G	G	A	C	T	G	C	A	C	C	T	G	G	A	G	G	A	T	C	C	T	C	T	T	C	T	T	G	G	T	G	G	C	A	G	C	A	G	C	T	A	C	A	G	G	C	A	A		
UAM:	A	T	G	G	A	C	T	G	G	A	C	C	T	G	G	A	G	G	C	T	C	C	T	C	C	T	C	T	T	G	G	T	G	G	C	A	G	C	A	G	C	T	A	C	A	G	G	C	A	A		
HUM:	G	A	G	A	A	T	C	C	T	G	A	G	T	T	C	C	A	G	G	G	C	T	G	A	T	G	A	G	G	G	A	C	T	G	G	G	T	C	C	A	G	T	T	A	A	G	T	G	G			
UAM:	G	A	G	A	A	T	C	C	T	C	A	G	T	C	C	C	A	G	G	G	C	T	G	A	T	G	A	G	G	G	A	C	T	G	G	G	T	C	C	A	G	T	T	A	A	G	T	G	G			
HUM:	T	G	T	C	T	C	A	T	C	C	A	C	T	C	C	T	C	T	G	T	C	C	T	C	T	C	C	A	C	A	G	G	C	A	C	C	C	A	C	G	C	C	C	A	G	G	T	C	C	A		
UAM:	G	G	T	C	T	C	A	T	C	C	A	C	T	C	C	T	C	T	G	T	C	T	T	T	T	C	C	A	C	A	G	G	C	G	C	C	C	A	C	G	C	C	G	A	G	G	T	C	C	A		
HUM:	G	C	T	G	G	T	A	C	A	G	T	C	T	G	G	G	G	C	T	G	A	G	G	T	G	A	A	G	A	A	G	C	C	T	G	G	G	G	C	C	T	C	A	G	T	G	A	A	G	G		
UAM:	G	C	T	G	G	T	A	C	A	G	T	C	C	G	G	G	G	C	T	G	A	G	G	T	G	A	A	G	A	A	G	C	C	T	G	G	G	G	C	C	T	C	A	G	T	G	A	A	G	T		
HUM:	T	C	T	C	C	T	G	C	A	A	G	G	T	T	T	C	C	G	G	A	T	A	C	A	C	C	C	T	C	A	C	T	G	A	A	T	T	A	T	C	C	A	T	G	C	A	C	T	G	G		
UAM:	T	C	T	C	C	T	G	C	A	A	G	G	T	T	T	C	T	G	G	A	T	A	C	A	C	C	T	T	C	A	C	C	G	A	A	T	T	A	T	C	C	A	T	G	C	A	C	T	G	G		
HUM:	G	T	G	C	G	A	C	A	G	G	C	T	C	C	T	G	G	A	A	A	A	G	G	G	C	T	T	G	A	G	T	G	G	A	T	G	G	G	A	G	G	T	T	T	T	G	A	T	C	C		
UAM:	G	T	G	C	G	A	C	A	G	G	C	T	C	C	T	G	G	A	A	A	A	G	G	G	C	T	T	G	A	G	T	G	G	A	T	G	G	G	A	G	G	T	T	T	T	G	A	T	C	C		
HUM:	T	G	A	A	G	A	T	G	G	T	G	A	A	A	C	A	A	T	C	T	A	C	G	C	A	C	A	G	A	A	G	T	T	C	C	A	G	G	G	C	A	G	A	G	T	C	A	C	C	A		
UAM:	T	G	A	T	G	A	T	G	G	T	G	A	A	A	C	A	A	T	C	T	A	C	G	C	A	C	A	G	A	A	G	T	T	C	C	A	G	G	G	C	A	G	A	G	T	C	A	C	C	A		
HUM:	T	G	A	C	C	G	A	G	G	A	C	A	C	A	T	C	T	A	C	A	G	A	C	A	C	A	G	C	C	T	A	C	A	T	G	G	A	G	C	T	G	A	G	C	A	G	C	C	T	G		
UAM:	T	G	A	C	C	G	A	G	G	A	C	A	C	G	T	C	T	A	C	A	G	A	C	A	C	A	C	A	G	C	C	T	A	C	A	T	G	G	A	G	C	T	G	A	G	C	A	G	C	C	T	G
HUM:	A	G	A	T	C	T	G	A	G	G	A	C	A	C	G	G	C	C	G	T	G	T	A	T	T	A	C	T	G	T	G	C	A	A	C	A	G	A														
UAM:	A	G	A	T	C	T	G	A	G	G	A	C	A	C	G	G	C	C	A	T	G	T	A	T	T	A	C	T	G	T	G	C	A	A	C	A	G	A														

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	G	T	C	A	G	A	A	A	C	C	C
UAM:	G	T	C	A	G	A	A	A	C	C	C

IGHV3-23

GENE ALIGN SEQ

HUM:	A	T	G	G	A	G	T	T	T	G	G	G	C	T	G	A	G	C	T	G	G	C	T	T	T	T	T	C	T	T	G	T	G	G	C	T	A	T	T	T	T	A	A	A	A	G	G	T	A	A
UAM:	A	T	G	G	A	G	T	T	T	G	G	G	C	T	G	A	G	C	T	G	G	G	T	T	T	T	T	C	T	T	G	T	G	G	C	T	A	T	T	T	T	A	A	A	A	G	G	T	A	A
HUM:	T	T	C	A	T	G	G	A	G	A	A	A	T	A	G	A	A	A	A	T	T	G	A	G	T	G	T	G	A	A	T	G	G	A	T	A	A	G	A	G	T	G	A	G	A	A	A			
UAM:	T	T	C	A	T	G	G	A	G	A	A	A	T	A	G	A	A	A	A	T	T	G	A	G	T	G	T	G	A	G	T	G	G	T	T	A	A	G	A	G	T	G	G	G	A	T	A	A	A	
HUM:	C	A	G	T	G	G	A	T	A	C	G	T	G	T	G	G	C	A	G	T	T	T	C	T	G	A	C	C	A	G	G	G	T	T	T	C	T	T	T	T	T	G	T	T	T	G	C	A	G	G
UAM:	C	A	G	T	G	G	A	T	A	C	G	T	G	T	G	G	A	A	G	T	T	T	C	T	G	A	C	C	A	G	G	G	T	T	T	C	T	T	T	T	T	G	T	T	T	G	T	A	G	G
HUM:	T	G	T	C	C	A	G	T	G	T	G	A	G	G	T	G	C	A	G	C	T	G	T	T	G	G	A	G	T	C	T	G	G	G	G	A	G	G	C	T	T	G	G	T	A	C	A	G	C	
UAM:	T	G	T	C	C	A	G	T	G	T	G	A	G	G	T	G	C	A	G	C	T	G	G	T	T	G	G	A	G	T	C	T	G	G	G	G	A	G	G	C	T	T	G	G	T	A	C	A	G	C
HUM:	C	T	G	G	G	G	G	T	C	C	C	T	G	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	G	A	T	T	C	A	C	C	T	T	T	A	G	-	
UAM:	C	T	G	G	G	G	G	T	C	C	C	T	G	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	G	A	T	T	C	A	C	-	-	-	-	-	G	T	
HUM:	-	C	A	-	-	-	-	-	-	-	-	-	-	-	G	C	T	A	T	G	C	-	C	A	T	G	A	G	C	T	G	G	G	T	C	C	G	C	C	A	G	G	C	T	C	C	A	G	G	
UAM:	T	C	A	C	T	A	A	C	T	A	C	T	A	C	C	-	-	-	-	T	G	C	A	-	-	-	-	-	C	T	G	G	T	T	C	C	G	C	C	A	G	G	C	T	C	C	A	G	G	
HUM:	G	A	A	G	G	G	G	C	T	G	G	A	G	T	G	G	G	T	C	T	C	A	G	C	-	T	A	T	-	-	-	-	-	T	A	G	T	G	G	T	A	G	T	G	G	T	G	G	T	A
UAM:	G	A	A	G	G	G	G	C	T	G	G	A	G	T	G	G	G	T	C	-	-	-	G	C	A	T	A	T	A	T	T	A	G	T	A	G	T	G	G	T	A	G	T	G	G	T	G	G	T	A
HUM:	G	C	A	C	A	T	A	C	T	A	C	G	C	A	G	A	C	T	C	C	G	T	G	A	A	G	G	G	C	C	G	G	T	T	C	A	C	C	A	T	C	T	C	C	A	G	A	G	A	C
UAM:	G	C	A	C	A	A	A	C	T	A	C	C	C	A	G	A	T	T	C	T	G	T	G	A	A	G	G	G	C	C	G	A	T	T	C	A	C	C	A	T	C	T	C	C	A	G	A	G	A	C
HUM:	A	A	T	T	C	C	A	A	G	A	A	C	A	C	G	C	T	G	T	A	T	C	T	G	C	A	A	A	T	G	A	A	C	A	G	C	C	T	G	A	G	A	G	C	C	G	A	G	G	A
UAM:	A	A	C	G	C	C	A	A	G	A	A	C	A	C	G	C	T	G	T	A	T	C	T	G	C	A	A	A	T	G	A	A	C	A	G	C	C	T	G	A	G	A	G	C	C	G	A	G	G	A
HUM:	C	A	C	G	G	C	C	G	T	A	T	A	T	T	A	C	T	G	T	G	C	G	A	A	A	G	A																							
UAM:	C	A	C	G	G	C	T	G	T	G	T	A	T	T	A	C	T	G	T	G	C	G	A	G	A	G	A																							

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	G	A	C	A	C	A	A	A	C	C	T
UAM:	G	A	C	A	C	A	A	A	C	C	T

IGHVIII-22-2

GENE ALIGN SEQ

HUM: A T A G A G T T A G G G C T G A G C T G - - G G T T T T C T T G T T G C T A T T T T A A A A G G C A
UAM: A T A G A G T T A G G G C T G A G - - G T A G G T T T T C T T G T T G C T A T T T T A A A A G G C A

HUM: A A T A A T G G A G A A C T A G A G A T A T T A A G C A T G A G T G G A T G T G A G T G A A A A T A
UAM: A A T A A T G G A G A A G T A G A G A T A T T G A G T G T G A G T G A A A A T A

HUM: C A G T G A T T A T G T G T G G C A G G T T C G G A C C A A A A T G T C C C T A T G T T T G T A G G
UAM: C A G T G A T T A T A T G T G G C A G G T T C T G A C C A A A A T G T C T C T G T G T T T G T A G G

HUM: T G T - - - C T A G T G T G A G G T G C A G G T G G T G G A G T G T A G G G G A G A G
UAM: T G T T T A C T A - - - T G A G G T G C A G G T G G T G G A G T C T C G G G G A G A G

D7

HUM: A C A A G A G
UAM: G C A A G A G

D9

HUM: G G G T G A G G C T G
UAM: G G G T G A G C T G T

IGHVII-22-1

GENE ALIGN SEQ

HUM: G G C C T G G T G A A G C C C T C A C A G A T C C T C C C C C T G G C C T G T G G C A T C T C T G C
UAM: G G C C T G G T G A A G C C C T C A C A G A T C C T C C C C C T C G C C T G T G C C A T C T C T G C

HUM: T T C T C C A T T A C A A C C A G T G C T T C C T G C T G G A G C T G G A T C C G T C A - C C C C C
UAM: C T C T C C A T T A C A A C C A G T G C T T C C T G C T G T A G C T A G A T C C A T C A G C C C C C

HUM: C G G G G A A G G G A C T G G A G C G A A T C A G G T G C A C A - G G T - C A T G A G G G A G T G C
UAM: C A G G G A A G G G A C G G G A G T G A A A C A G G T G C A C A A - - T A C A T G A G A G A G T G C

HUM: A C A A T C C A A C C C A C T C C T C A A G A G T C C A G T C A C C A T C T C C A G A T C C A C A T
UAM: A C A A T C C A A C C C A C T C C T C A A G A G T C C A G T C G C C A T C T C C A G A T C C A C A T

HUM: C C A A A A A A C A G T T T C T C C T A C A G C T G A G C T A C C T - - - T A A C A A G G A G T A
UAM: C C A A A A A G C T G T T T T T C C T A C A G C T G A G C T A A C T G A G C - A A C - - - G A G T A

HUM: C A C A A C C A T G A - T T T T T A T A C A A A A G A
UAM: C A C A A C C A T G A A T T T T T A C A C A A A A G A

D7

HUM: C A C A G C G
UAM: C A G G G T A

D9

HUM: G A A C A C T C T A C
UAM: G T C A C A A A C C T

IGHV3-22

GENE ALIGN SEQ

HUM:	A	T	G	G	A	G	T	C	A	T	-	-	G	G	C	T	G	A	G	C	T	G	G	G	T	T	T	T	C	T	T	G	C	C	G	C	T	A	T	T	T	T	A	A	A	A	G	G	T	
UAM:	A	T	G	G	A	G	T	-	-	T	T	G	G	G	C	T	G	A	G	C	T	G	G	G	T	T	T	T	C	C	T	T	G	T	T	G	C	T	A	T	T	T	T	A	A	A	A	G	G	T
HUM:	A	A	T	T	C	A	T	-	-	T	G	A	G	A	A	C	T	A	T	T	G	A	-	A	-	A	T	T	G	A	G	T	G	T	G	A	G	-	-	-	-	C	G	G	A	T	A	A	G	A
UAM:	A	A	T	T	C	A	T	G	G	T	-	-	G	A	A	C	T	A	-	-	G	A	G	A	C	A	C	T	G	A	G	T	G	T	G	A	G	G	T	G	A	C	-	-	A	T	-	-	G	A
HUM:	G	T	G	A	G	A	G	A	A	A	C	A	G	T	G	G	A	T	A	C	G	T	G	T	G	G	C	A	G	T	T	T	C	T	G	A	-	-	-	C	C	A	G	G	G	T	T	T	C	T
UAM:	G	T	G	A	G	A	G	A	A	A	C	A	G	T	G	G	A	T	A	T	G	T	G	T	G	G	C	T	G	T	T	T	C	T	G	A	T	T	A	-	C	A	A	T	G	T	C	T	C	T
HUM:	-	T	T	T	T	G	T	T	T	G	C	A	G	G	T	G	T	C	C	A	G	T	G	T	G	A	G	G	T	G	C	A	G	C	T	G	G	T	G	G	A	G	T	C	T	G	G	G	G	G
UAM:	G	-	-	-	T	G	T	T	T	G	C	A	G	G	T	G	T	C	C	A	G	T	G	T	G	A	G	G	T	G	C	A	G	C	T	G	G	T	G	G	A	G	T	C	T	G	G	G	G	G
HUM:	A	G	G	C	T	T	G	G	T	A	C	A	G	C	C	T	G	G	G	G	G	T	C	C	C	T	G	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	
UAM:	A	G	G	C	T	T	G	G	T	A	C	A	G	C	C	T	G	G	G	G	A	T	C	C	C	T	G	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	
HUM:	G	A	T	T	C	A	C	C	T	T	C	A	G	T	T	A	C	T	A	C	T	A	C	A	T	G	A	G	C	-	-	-	G	G	G	G	T	C	C	G	C	C	A	G	G	C	T	C	C	-
UAM:	G	A	T	T	C	A	C	C	T	T	C	A	G	T	A	A	C	T	A	C	T	A	C	A	T	G	-	-	C	A	T	T	-	G	G	G	T	C	C	G	C	C	A	G	G	C	T	C	C	A
HUM:	C	G	G	G	-	A	A	G	G	G	G	C	T	G	G	A	A	T	G	G	G	T	A	G	G	T	T	T	C	A	T	T	A	G	A	A	A	C	A	A	A	G	C	T	A	A	T	G	G	T
UAM:	-	-	G	G	A	A	A	G	G	G	G	C	T	G	G	A	A	T	G	G	G	T	A	G	G	T	T	T	C	A	T	T	A	G	A	A	C	C	A	A	A	G	C	T	A	A	A	G	G	T
HUM:	G	G	G	A	C	A	A	C	A	G	A	A	T	A	-	G	A	C	C	A	C	G	T	C	T	G	T	G	A	A	A	G	G	C	A	G	A	T	T	C	A	C	A	A	T	C	T	C	A	A
UAM:	G	G	G	A	C	A	A	C	A	G	A	A	T	A	C	G	-	C	C	G	C	G	T	C	T	G	T	G	A	A	A	G	G	C	A	G	A	T	T	C	A	C	C	A	T	C	T	C	A	A
HUM:	G	A	G	A	T	G	A	T	T	C	C	A	A	A	A	G	C	A	T	C	A	C	C	T	A	T	C	T	G	C	A	A	A	T	G	A	A	G	A	G	C	C	T	G	A	A	A	A	C	C
UAM:	G	A	G	A	T	G	A	T	T	C	C	A	A	A	A	G	C	A	T	C	G	C	C	T	A	T	C	T	G	C	A	A	A	T	G	A	A	C	A	G	C	C	T	G	A	A	A	A	C	C
HUM:	G	A	G	G	A	C	A	C	G	G	C	C	G	T	G	T	A	T	T	A	C	T	G	T	-	-	T	C	C	A	G	A	G	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UAM:	G	A	G	G	A	C	A	C	G	G	C	T	G	T	G	T	A	T	T	A	C	T	G	T	A	C	T	-	-	A	G	A	G	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-		

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	G	A	C	A	C	A	A	A	C	C	T
UAM:	G	A	C	A	C	A	A	A	C	C	T

IGHVII-20-1

GENE ALIGN SEQ

HUM: C A C A G T - G A - - G G G G A C A T C A G T G T G A G C C C A G A C A C A A A C C
UAM: - - - - - T C G A A C G G G G - - - - C A - - - - G A G C C C - - - - - - - A C C

D7

HUM: T C C C T A T
UAM: T C A G C T C

D9

HUM: G G T G C T G A G G A
UAM: G A C T C C A G C T C

IGHV1-17

GENE ALIGN SEQ

HUM:	A	T	G	G	A	C	T	G	T	A	C	C	T	G	G	G	G	A	T	C	C	T	C	T	T	C	T	T	G	G	T	G	G	C	A	G	C	T	G	C	C	A	C	A	G	G	T	A	A		
UAM:	A	T	G	G	A	C	T	G	T	A	C	C	T	G	G	G	G	A	T	C	C	T	C	T	T	C	T	T	G	G	T	G	G	C	A	G	C	T	G	C	C	A	C	A	G	G	T	A	A		
HUM:	G	G	G	G	C	T	C	C	C	A	A	G	T	C	C	T	A	G	T	G	A	T	G	A	G	G	A	G	G	G	A	T	T	G	A	G	T	C	C	A	G	T	C	A	A	-	G	G	G		
UAM:	G	G	G	G	C	T	C	C	C	A	A	G	T	C	C	C	A	G	T	G	A	T	G	A	G	G	A	G	G	G	A	T	T	G	A	G	T	C	C	A	G	T	C	A	A	G	G	G	G		
HUM:	G	G	C	T	T	T	T	A	T	C	A	T	C	T	C	C	T	C	T	C	C	T	T	C	T	C	C	T	C	A	C	A	G	A	T	G	T	C	C	A	T	T	C	C	C	A	G	G	T	T	C
UAM:	G	G	C	T	T	T	T	A	T	C	A	A	C	T	C	C	T	C	C	T	T	C	T	C	C	T	C	A	C	A	G	G	T	G	T	C	C	A	T	T	C	C	A	A	G	G	T	T	C		
HUM:	A	G	C	T	G	T	T	G	C	A	G	C	C	T	G	G	G	G	C	T	G	A	G	G	T	G	A	A	G	A	A	G	C	C	T	G	C	G	T	C	C	T	C	A	G	T	G	A	A	G	
UAM:	A	G	C	T	G	T	T	G	C	A	G	C	C	T	G	G	G	G	C	T	G	A	G	G	T	G	A	A	G	A	A	G	C	C	T	G	G	G	T	C	C	T	C	A	G	T	G	A	A	G	
HUM:	G	T	C	T	C	C	T	G	C	C	A	G	G	C	T	T	C	C	A	G	A	T	A	C	A	C	C	T	T	C	A	C	C	A	A	A	T	A	C	T	T	T	A	C	A	C	A	G	T	G	
UAM:	G	T	C	T	C	C	T	G	C	C	A	G	G	C	T	T	C	C	A	G	A	C	A	C	A	C	C	T	T	C	A	C	C	A	A	A	T	A	C	T	T	T	A	C	G	C	A	G	T	G	
HUM:	G	G	T	G	C	G	A	C	A	G	G	G	C	C	C	T	G	G	A	C	A	A	G	G	G	C	A	T	A	G	T	G	G	T	T	G	G	G	A	T	G	C	A	T	C	A	A	C	C	C	
UAM:	G	G	T	G	C	A	A	C	A	G	G	G	C	C	C	T	G	G	A	C	A	A	G	G	G	C	A	T	A	G	T	G	G	A	T	G	G	G	A	T	G	C	A	T	C	A	A	C	C	C	
HUM:	T	T	A	C	A	A	T	G	A	T	A	A	C	A	C	A	C	A	C	T	A	C	G	C	A	C	A	G	A	A	G	T	T	C	C	G	G	G	G	C	A	G	A	G	T	C	A	C	C	A	
UAM:	T	T	A	C	A	A	T	G	A	T	A	A	C	A	C	A	C	A	C	T	A	C	G	C	A	C	A	G	A	A	G	T	T	C	C	G	G	G	G	C	A	G	A	G	T	C	A	C	C	A	
HUM:	T	T	A	C	C	A	G	T	G	A	C	A	G	G	T	C	C	G	T	G	A	G	C	A	C	A	G	C	C	T	A	C	A	T	G	G	A	G	C	T	G	A	G	C	A	G	C	C	T	G	
UAM:	T	T	A	C	C	A	G	T	G	A	C	A	G	G	T	C	C	A	T	G	A	G	C	A	C	A	G	C	C	T	A	C	A	T	G	G	A	G	C	T	G	A	G	C	A	G	C	C	T	G	
HUM:	A	G	A	T	C	T	G	A	A	G	A	C	A	T	G	G	T	C	G	T	G	T	A	T	T	C	C	T	G	T	G	T	G	A	G	A	G	A													
UAM:	A	G	A	T	C	T	G	A	A	G	A	C	A	T	G	G	T	C	G	T	G	T	A	T	T	C	C	T	G	T	G	T	G	A	G	A	G	A													

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	G	T	C	A	G	A	A	A	C	C	C
UAM:	G	T	C	A	G	A	A	A	C	T	C

IGHVIII-16-1

GENE ALIGN SEQ

HUM:	A	A	G	T	C	C	T	G	T	G	T	G	T	A	A	A	T	T	T	A	C	T	G	A	T	-	-	-	-	-	A	G	A	G	-	-	-	-	T	C	A	G	G	G	G	G	A	A	A	
UAM:	A	A	G	T	C	C	T	G	T	G	T	A	A	A	A	T	T	T	A	T	T	G	A	T	G	G	A	T	T	C	A	G	A	G	G	G	G	G	-	-	A	-	-	-	-	-	A	A	A	
HUM:	A	T	T	G	T	A	C	A	G	C	C	C	A	G	T	G	G	T	T	C	A	C	T	G	A	G	A	C	T	C	T	C	A	T	G	C	A	A	A	G	C	C	T	C	T	G	A	T	T	T
UAM:	A	T	T	G	T	A	C	A	G	C	C	C	A	G	T	G	G	T	T	C	A	C	T	G	A	G	A	C	T	C	T	C	A	T	G	C	A	A	A	G	C	C	T	C	T	G	A	T	T	T
HUM:	C	A	C	C	T	T	T	A	C	T	G	G	C	T	A	C	A	G	C	A	T	G	A	G	C	T	T	G	G	T	C	C	A	G	C	A	G	G	C	T	T	C	A	T	G	A	C	A	G	G
UAM:	C	A	C	C	T	T	T	A	C	T	G	G	C	T	A	C	A	G	C	A	T	G	A	G	C	T	T	G	C	T	C	C	A	G	C	C	G	G	C	T	T	C	A	T	G	A	C	A	G	G
HUM:	G	A	T	T	G	G	T	G	T	G	G	G	T	G	G	A	A	A	C	A	G	T	G	A	G	T	G	A	T	C	A	A	G	T	G	G	A	G	T	T	C	T	C	A	G	A	G	T	T	
UAM:	G	A	T	T	T	G	T	G	T	G	G	G	T	G	G	A	A	A	C	A	G	T	G	A	G	T	G	A	T	C	A	A	G	T	G	G	A	G	T	T	C	T	C	A	G	A	G	T	T	
HUM:	A	C	T	C	T	C	C	A	T	G	A	G	T	A	C	A	A	A	T	A	A	A	T	T	A	A	C	A	G	T	C	C	C	A	A	G	C	G	A	C	A	C	C	T	T	T	T	C	A	T
UAM:	A	C	T	C	T	C	C	A	T	G	A	G	T	A	C	A	A	A	T	A	A	A	T	T	A	A	C	A	G	T	C	C	C	A	A	G	C	G	A	C	A	C	C	T	T	T	T	A	A	T
HUM:	G	T	G	C	A	G	T	C	T	A	C	C	T	T	A	A	A	G	G	G	A	C	C	A	A	A	C	T	G	A	A	A	G	T	C	A	A	G	G	A	C	A	A	G	G	C	C	T	T	G
UAM:	A	T	G	C	A	G	T	C	T	A	C	C	T	T	A	A	A	G	G	G	A	C	C	A	A	A	C	T	G	A	A	A	G	T	C	A	A	G	G	A	C	A	A	G	G	C	C	T	T	G
HUM:	T	A	A	T	A	C	T	G	T	G	A	G	A	G	A																																			
UAM:	T	A	A	T	A	C	T	G	T	G	A	G	A	G	A																																			

D7

HUM:	C	A	C	A	G	G	A
UAM:	C	A	C	A	G	G	A

D9

HUM:	A	G	A	C	A	G	A	A	A	A	A
UAM:	A	G	A	C	A	G	A	A	A	A	A

IGHV3-16

GENE ALIGN SEQ

HUM: A T G G A A T T T G G G C T G A G C T G G G T T T T T C T T G C T G G T A T T T T A A A A G G T G A
UAM: A T G A A A T T T G G G C T A A G T T G G G T T T T T C T T G C T G C T A T T T T A A A A G A T A A

HUM: T T C A T G G A G A A C T A A G G A T A T T G A G T G - - A G T G G A C A T G A G T G A G A G A A A
UAM: T T C A T G G A G A A C T A A G G A T A T T G A G T G T G A G T G G A C A T G A G T G A C A G A A -

HUM: C A G T G G A T A T G T G T G G C A G T T T C T G A C C A G G G T G T C T C T G T G T T T G C A G G
UAM: C A G C G G A T A T G T G T G G C A G T T T C T G A C C A G G A T G T C T C - - T G T T T G C A G G

HUM: T G T C C A G T G T G A G G T G C A G C T G G T G G A G T C T G G G G G A G G C T T G G T A C A G C
UAM: T G T G C A G T G T G A G G T G C A G C T G G T G G A G T C T G G G G G A G G G T T G G T A C A G C

HUM: C T G G G G G T C C C T G A G A C T C T C C T G T G C A G C C T C T G G A T T C A C C T T C A G T
UAM: C T G G G G G T C C C T G A G A C T C T C C T G T G C A G C C T C T G G A T T C A C C T T C A G T

HUM: A A C A G T G A C A T G A A C T G G G C C C G C A A G G C T C C A G G A A A G G G G C T G G A G T G
UAM: A A C A C T G A C A T G A A C T G G G T C C G C G A G G C T T C A G G A A A G G G G C T G G A G T G

HUM: G G T A T C - - G G G T G T T A G T T G G A A T G G C A G T A G G A C G C A C T A T G T G G A C T C
UAM: G G T - - C T T G G G T A T T A G T T G G A A T G G T G G T A G G A T G C A C T A T G C G G A C T C

HUM: C G T G A A G C G C C G A T T C A T - - C A T C T C C A G A G A C A A T T C C A G G A A - C T C C C
UAM: C G T G A A G G G C C G A T T - - T A C C A T C T C C A G A G A C A A T T C C A G G A A G C - C C C

HUM: T G T A T C T G C A A A A G A A C A G A C G G A G A G C C G A G G A C A T G G C T G T G T A T T A C
UAM: T G T A T C T G C A A A A G A A C A G A C G G A G A G C C G A G G A C A T G G C C G T G T A T T A C

HUM: T G T G T G A G A A A
UAM: T G T G T G A G A A A

D7
HUM: T C C T G T G
UAM: T C C T G T G

D9
HUM: G A C A C A A A C C T
UAM: G A C A C A A A C C T

IGHVII-15-1

GENE ALIGN SEQ

HUM: G T T C T A G T A A A G C C C T C A G A G A C C C T C T C C T T C A C C T G T G C T G T C T C T G G
UAM: G T T C T A G T A A A G C C C T C A G A G A C C C T C T C C T T C A C C T G T G C T G C C T C T G G

HUM: A T T T C C A A T C A T A A C C A G T A C T T C C T C C T G G A G C T G T A T C T G C C A G C C C C
UAM: A T T T C C G A T C A T A A C C A G T A C T T C C T C C T G G G G C T G G A T C T G C C A G C C T C

HUM: C A G G G A A G A A G C T G A A G T G G G T C A G G T G T G T A G G T C A C G A G G A A A C A C A C
UAM: C A G G G A A G A A G C T G A A G T G G G T C A G G T G T G T A G G T C A T G A G G A A G C A C A C

HUM: A G T G C A A C C C G C T T C T C A A G A G T C C A G T C A C C A C C T C C A G A T C C A C A T T C
UAM: A G T A C A A C C C G C T T C T C A A G A G T C C A G T C A C C A C C T C C A G A T C C A C A T T C

HUM: A G A A A A C A G T T T T T C C T A C A G C T G A G C T A C C - - C G C - A C A A T G A G T A A A C
UAM: A G A A A G C A G T T T T T C C T A C A G C T G A G C T A C C T G C G C A A C A A - - - G T A C A C

HUM: C A C C A T G G A T T T T T A T A C A A A A G A
UAM: C A C C A T G G A T T T T T A T A C A A A A G A

D7

HUM: C A C A G A A
UAM: C A C A G A G

D9

HUM: A C A C A A A C C T C
UAM: A C A C A A A C C T C

IGHV3-15

GENE ALIGN SEQ

HUM:	A	T	G	G	A	G	T	T	T	G	G	G	C	T	G	A	G	C	T	G	A	T	T	T	T	C	C	T	T	G	C	T	G	C	T	A	T	T	T	T	A	A	A	A	G	G	T	G	A	
UAM:	A	T	G	G	A	G	T	T	T	G	T	G	C	T	G	A	G	C	T	G	G	G	T	T	T	T	C	C	T	T	G	C	T	G	C	T	A	T	T	T	T	A	A	A	A	G	G	T	G	A
HUM:	T	T	T	A	T	G	G	A	G	A	A	C	T	A	G	A	G	A	G	A	T	T	A	A	G	T	G	T	G	A	G	T	G	G	A	C	G	T	G	A	G	T	G	A	G	A	A	A		
UAM:	T	T	T	A	T	G	G	A	G	A	A	C	T	A	G	A	G	A	G	A	T	T	G	A	G	T	G	T	G	A	G	T	G	G	A	C	A	T	G	A	G	T	G	A	G	A	A	A		
HUM:	C	A	G	T	G	G	A	T	A	T	G	T	G	T	G	G	C	A	G	T	T	T	C	T	G	A	T	C	T	T	A	G	T	G	T	C	T	C	T	G	T	G	T	T	T	G	C	A	G	G
UAM:	C	A	G	T	G	G	A	T	T	T	G	T	G	T	G	G	C	A	G	T	T	T	C	T	G	A	C	C	T	T	A	G	T	G	T	C	T	C	T	G	T	G	T	T	T	G	C	A	G	G
HUM:	T	G	T	C	C	A	G	T	G	T	G	A	G	G	T	G	C	A	G	C	T	G	G	T	G	G	A	G	T	C	T	G	G	G	G	A	G	G	C	T	T	G	G	T	A	A	A	G	C	
UAM:	T	G	T	C	C	A	G	T	G	T	G	A	G	G	T	G	C	A	G	C	T	G	G	T	G	G	A	G	T	C	T	G	G	G	G	A	G	G	C	T	T	G	G	T	C	C	A	G	C	
HUM:	C	T	G	G	G	G	G	T	C	C	C	T	T	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	G	A	T	T	C	A	C	T	T	T	C	A	G	T	
UAM:	C	T	G	G	G	G	G	T	C	C	C	T	T	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	G	A	T	T	C	A	C	T	T	T	C	A	G	T	
HUM:	A	A	C	G	C	C	T	G	G	A	T	G	A	G	C	T	G	G	G	T	C	C	G	C	C	A	G	G	C	T	C	C	A	G	G	A	A	G	G	G	G	C	T	G	G	A	G	T	G	
UAM:	A	A	C	G	C	C	T	G	G	T	T	G	A	G	C	T	G	G	G	T	C	C	G	C	C	A	G	G	C	T	C	C	A	G	G	A	A	G	G	G	G	C	T	G	G	A	G	T	G	
HUM:	G	G	T	T	G	G	C	C	G	T	A	T	T	A	A	A	A	G	C	A	A	A	A	C	T	G	A	T	G	G	T	G	G	G	A	C	A	A	C	A	G	A	C	T	A	C	G	C	T	G
UAM:	G	G	T	T	G	G	C	C	G	T	A	T	T	A	A	A	A	G	C	A	A	A	A	C	T	G	A	T	G	G	T	G	G	G	A	C	A	A	C	A	G	A	C	T	A	C	G	C	T	G
HUM:	C	A	C	C	C	G	T	G	A	A	A	G	G	C	A	G	A	T	T	C	A	C	C	A	T	C	T	C	A	A	G	A	G	A	T	G	A	T	T	C	A	A	A	A	A	A	C	A	C	G
UAM:	C	A	C	C	T	G	T	G	A	A	A	G	G	C	A	G	A	T	T	C	A	C	C	A	T	C	T	C	A	A	G	A	G	A	T	G	A	T	T	C	A	A	A	A	A	A	C	A	C	T
HUM:	C	T	G	T	A	T	C	T	G	C	A	A	A	T	G	A	A	C	A	G	C	C	T	G	A	A	A	A	C	C	G	A	G	G	A	C	A	C	A	G	C	C	G	T	G	T	A	T	T	A
UAM:	T	T	G	T	A	T	C	T	G	C	A	A	A	T	G	A	A	C	A	G	C	C	T	G	A	A	A	A	C	C	G	A	G	G	A	C	A	C	G	G	C	C	G	T	G	T	A	T	T	A
HUM:	C	T	G	T	-	A	C	C	-	A	C	A	G	A																																				
UAM:	C	T	G	T	G	-	-	C	T	A	C	A	G	A																																				
D7																																																		
HUM:	C	A	C	A	G	T	G																																											
UAM:	C	A	C	A	G	T	G																																											
D9																																																		
HUM:	G	A	C	A	C	A	A	A	C	C	T																																							
UAM:	G	A	C	A	C	A	A	A	C	C	T																																							

IGHVIII-13-1

GENE ALIGN SEQ

HUM: A A G T C C C C T G T G A A G T T A A C T A A T G G A G T T A G A C A G A G A A A T A C T A C A G A
UAM: A A G T C C C C T G T G A A G T T A A C T A A T G G A G T C A G A C A G A G A A A T A C T A C A G A

HUM: C C A G G A A T T C T G C C T T T T C T G C A A A G C C T C T G G A T T C A C T T T C A C T G A A A
UAM: C C A G G A A T T C T G C C T T T T C T G C A A A G C C T C T G G A T T C A C T T T C A C T G A A A

HUM: A C A G C A T A A G C T T G A T C C A G C A G G C T T C A T G A C A G G G G T G G G T G T G G G T A
UAM: A C A G C A T A A G C T T G A T C C A G C A G G C T T C A T G A C A G G G G T G G G T G T G G G T A

HUM: A T A A C A A T A A T T C A A A T A G A A G T T C T C A G T G G G A C T C T C C T T G A G T A A A A
UAM: A T A A C A A T A A T T C A A A T G G A A G T T C T C A G T G G G A C T C T C C T T C A G T A A A A

HUM: A G A T G A T T A A C A A T C C T C A A A T A C A C T C A G T T C A G G A G A T T C T C T T T T A A
UAM: A G A T G A A T A A C A A T C C T C A A A T A C A C T C A G T T C A G G A G A T T C T C T T T T A A

HUM: G A T G A T T A A C C T G A G A G C T C A G G A A A A G T C C G T G T A T T A C T T T G A G G G A
UAM: G A T G A T T A A C C T G A A A G C T C A G G A A A A G T C C G T G T A T T A C T T T G A G G G A

D7

HUM: C A C A G T G
UAM: C A C A G T G

D9

HUM: G A C A C C A A C C T
UAM: G A C A C C A A C C T

IGHV3-13

GENE ALIGN SEQ

HUM:	A	T	G	G	A	G	T	T	G	G	G	G	C	T	G	A	G	C	T	G	G	G	T	T	T	T	C	C	T	T	G	T	T	G	C	T	A	T	A	T	T	A	G	A	A	G	T	G	A	
UAM:	A	T	G	G	A	G	T	T	T	G	T	G	C	T	G	A	G	C	T	G	G	G	T	T	T	T	C	C	T	T	C	T	T	G	C	T	A	T	A	T	T	A	A	A	A	G	G	T	G	A
HUM:	T	T	C	A	T	G	G	A	G	A	A	C	T	A	G	A	G	A	T	A	T	T	G	A	G	T	G	T	G	A	A	T	G	G	G	C	A	T	G	A	A	T	G	A	G	A	A	A		
UAM:	T	T	C	A	T	G	G	A	G	A	A	C	T	A	G	A	G	A	T	A	T	T	G	A	G	T	G	T	G	A	A	T	G	G	G	C	A	T	G	A	G	T	G	A	G	A	A	A		
HUM:	C	A	G	T	G	G	G	T	A	T	G	T	G	T	G	G	C	A	A	T	T	T	C	T	G	A	C	T	T	T	T	G	T	G	T	C	T	C	T	G	T	G	T	T	T	G	C	A	G	G
UAM:	C	A	G	T	G	G	A	T	A	T	G	T	G	T	G	G	C	A	A	T	T	T	C	T	G	A	C	T	T	T	T	G	T	G	T	C	T	C	T	G	T	G	T	T	T	G	C	A	G	G
HUM:	T	G	T	C	C	A	G	T	G	T	G	A	G	G	T	G	C	A	G	C	T	G	G	T	G	G	A	G	T	C	T	G	G	G	G	A	G	G	C	T	T	G	G	T	A	C	A	G	C	
UAM:	T	G	T	C	C	A	G	T	G	T	G	A	G	G	T	G	C	A	G	C	T	G	G	T	G	G	A	G	T	C	T	G	G	G	G	A	G	G	C	T	T	G	G	T	A	C	A	G	C	
HUM:	C	T	G	G	G	G	G	T	C	C	C	T	G	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	G	A	T	T	C	A	C	C	T	-	T	C	A	G	
UAM:	C	T	G	G	G	G	G	T	C	C	C	T	G	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	G	A	T	T	C	A	C	-	T	G	T	C	A	G	
HUM:	T	A	G	C	T	A	C	G	A	C	A	T	G	C	A	C	T	G	G	G	T	C	C	G	C	C	A	A	G	C	T	A	C	A	G	G	A	A	A	A	G	G	T	C	T	G	G	A	G	T
UAM:	T	A	G	C	T	A	C	G	A	C	A	T	G	C	A	C	T	G	G	G	T	T	C	G	C	C	A	G	G	C	T	C	C	A	G	G	A	A	A	A	G	G	T	C	T	G	G	A	G	T
HUM:	G	G	G	T	C	T	C	A	G	C	T	A	T	T	G	G	T	A	C	T	G	C	T	G	G	T	G	A	C	A	C	A	T	A	C	T	A	T	C	C	A	G	G	C	T	C	C	G	T	G
UAM:	G	G	G	T	C	T	C	A	G	C	T	A	T	T	G	A	T	A	C	T	G	A	T	G	G	T	G	A	C	A	C	A	T	A	C	T	A	T	G	C	A	G	A	C	T	C	T	G	T	G
HUM:	A	A	G	G	G	C	C	G	A	T	T	C	A	C	C	A	T	C	T	C	C	A	G	A	G	A	A	A	A	T	G	C	C	A	A	G	A	A	C	T	C	C	T	T	G	T	A	T	C	T
UAM:	A	A	G	G	G	C	T	G	A	T	T	C	A	C	C	A	T	C	T	C	C	A	G	A	G	A	A	A	A	T	G	C	C	A	A	G	A	A	C	T	C	T	T	T	G	T	A	T	C	T
HUM:	T	C	A	A	A	T	G	A	A	C	A	G	C	C	T	G	A	G	A	G	C	C	G	G	G	G	A	C	A	C	G	G	C	T	G	T	G	T	A	T	T	A	C	T	G	T	G	C	A	A
UAM:	T	C	A	A	A	T	G	A	A	C	A	G	C	C	T	G	A	G	A	G	C	C	A	A	G	G	A	C	A	C	G	G	C	T	G	T	G	T	A	T	T	A	C	T	G	T	G	C	A	A
HUM:	G	A	G	A																																														
UAM:	G	A	G	A																																														

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	G	A	C	A	C	A	A	A	C	C	T
UAM:	G	A	C	A	C	A	A	A	C	C	T

IGHV1-12

GENE ALIGN SEQ

HUM:	A	T	G	G	G	C	T	G	G	A	C	C	T	G	C	A	A	G	A	T	C	C	T	C	T	T	C	T	T	G	G	T	G	G	C	A	G	C	A	G	C	C	A	C	A	G	G	T	A	A
UAM:	A	T	G	G	G	C	T	G	G	A	C	C	T	G	C	A	A	G	A	G	C	C	T	C	T	T	C	T	T	G	G	T	G	G	C	A	G	C	A	G	C	C	A	C	A	G	G	T	A	A
HUM:	G	C	A	G	T	T	C	C	C	A	G	G	T	C	C	A	A	G	T	A	A	T	G	A	G	G	A	G	G	G	A	T	T	G	A	G	T	C	C	A	G	T	C	A	A	G	G	G	G	
UAM:	G	G	G	G	T	T	C	C	C	A	G	G	T	C	C	C	A	G	T	G	A	T	G	A	G	G	A	G	G	G	A	T	T	G	A	G	T	C	C	A	G	T	C	A	A	G	G	G	G	
HUM:	G	C	T	T	T	C	A	T	C	C	A	C	T	C	C	T	G	T	G	T	C	C	T	C	C	C	C	A	C	A	G	G	T	G	C	C	C	A	C	T	C	C	C	A	G	G	T	G	C	A
UAM:	G	C	T	T	T	C	A	T	C	C	A	C	T	C	C	T	G	T	G	T	C	C	T	C	C	C	C	A	C	A	G	G	T	G	C	C	C	A	C	T	C	C	C	A	G	G	T	G	C	A
HUM:	G	C	T	G	G	T	G	C	A	A	T	C	T	G	G	G	G	C	T	G	A	G	G	T	G	A	A	G	A	A	G	C	C	T	G	G	G	G	C	C	T	C	A	G	T	G	A	A	G	G
UAM:	G	C	T	G	G	T	G	C	A	A	T	C	T	G	G	G	G	C	T	G	A	G	G	T	G	A	A	G	A	A	G	C	C	T	G	G	G	T	C	C	T	C	A	G	T	G	A	A	G	G
HUM:	T	C	T	C	C	T	G	C	A	A	G	G	C	T	T	C	T	G	G	A	T	A	C	A	C	C	T	T	C	A	C	C	T	A	C	T	G	C	T	A	C	T	T	G	C	A	C	T	G	G
UAM:	T	C	T	C	C	T	G	C	A	A	G	G	C	T	T	C	T	G	G	A	T	A	C	A	C	C	T	T	C	A	C	C	T	A	C	T	G	C	T	A	C	T	T	G	C	A	C	T	G	G
HUM:	G	T	A	T	G	A	C	A	G	G	C	C	C	C	T	G	G	A	C	A	A	G	G	G	C	T	T	G	A	A	T	G	G	A	C	A	G	G	A	T										
UAM:	G	T	G	C	G	A	C	A	G	G	T	C	C	C	T	G	G	A	C	A	A	G	G	A	C	T	T	G	A	G	T	G	G	A	C	A	G	G	A	T										

D7

HUM:	T	T	T	A	G	T	T
UAM:	T	T	T	A	G	T	T

D9

HUM:	C	A	T	T	T	A	T	T	C	T	G
UAM:	C	A	T	T	T	A	T	T	C	T	G

IGHV3-11

GENE ALIGN SEQ

HUM:	A	T	G	G	A	G	T	T	T	G	G	G	C	T	G	A	G	C	T	G	G	G	T	T	T	T	C	C	T	T	G	T	T	G	C	T	A	T	T	A	T	A	A	A	A	G	G	T	G	A
UAM:	A	T	G	G	A	G	T	T	T	G	G	G	C	T	G	A	G	C	T	G	G	G	T	T	T	T	C	C	T	C	G	T	T	G	C	T	A	T	T	A	T	A	A	A	A	G	G	T	G	A
HUM:	T	T	T	A	T	G	G	A	G	A	A	C	T	A	G	A	G	A	C	A	T	T	G	A	G	T	G	G	A	C	G	T	G	A	G	T	G	A	G	A	T	A	A	G	C	A	G	T	G	A
UAM:	T	C	T	A	T	G	G	A	G	A	A	C	T	A	G	A	G	A	C	G	T	T	G	A	G	T	G	G	A	C	G	T	G	A	G	T	G	A	-	-	-	A	A	-	C	A	G	T	G	A
HUM:	A	T	A	T	A	T	G	T	G	G	C	A	G	T	T	T	C	T	G	A	C	T	A	G	G	T	T	G	T	C	T	C	T	G	T	G	T	T	T	G	C	A	G	G	T	G	T	C	C	A
UAM:	A	T	A	T	A	T	G	T	G	G	C	A	G	T	T	T	C	T	G	A	C	C	A	A	G	T	T	G	T	C	T	C	T	G	T	G	T	T	T	G	C	A	G	G	T	G	T	C	C	A
HUM:	G	T	G	T	C	A	G	G	T	G	C	A	G	C	T	G	G	T	G	G	A	G	T	C	T	G	G	G	G	A	G	G	C	T	T	G	G	T	C	A	-	A	G	C	C	T	G	G	A	
UAM:	G	T	G	T	G	A	G	G	T	G	C	A	G	C	T	G	G	T	G	G	A	G	T	C	T	G	G	G	G	A	G	G	C	T	T	G	G	T	-	A	C	A	G	C	C	T	G	G	G	
HUM:	G	G	G	T	C	C	C	T	G	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	G	A	T	T	C	A	C	C	T	T	C	A	G	T	-	G	A	C	T
UAM:	G	G	G	T	C	C	C	T	G	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	G	A	A	T	C	A	C	C	T	T	C	A	G	T	A	-	-	-	-
HUM:	A	C	-	-	-	T	A	C	A	T	G	A	G	C	T	G	G	A	T	C	C	G	C	C	A	G	G	C	T	C	C	A	G	G	G	A	A	G	G	G	G	C	T	G	G	A	G	T	G	G
UAM:	A	C	C	A	A	T	A	C	A	T	G	A	G	C	T	G	G	G	T	C	C	G	C	C	A	G	G	C	T	A	C	A	G	G	G	A	A	G	G	G	A	C	T	G	G	A	G	T	G	G
HUM:	G	T	T	T	C	A	T	A	C	A	T	T	A	G	T	-	-	-	-	-	-	A	G	T	A	G	T	G	G	T	A	G	T	A	C	-	C	A	T	A	T	A	-	C	T	A	C	G	C	A
UAM:	G	T	T	T	C	A	T	A	C	A	T	T	A	G	T	G	G	T	G	A	T	A	G	T	A	G	T	-	-	-	-	-	T	A	C	A	C	A	-	-	-	A	G	C	T	A	C	G	C	A
HUM:	G	A	C	T	C	T	G	T	G	A	A	G	G	G	C	C	G	A	T	T	C	A	C	C	A	T	C	T	C	C	A	G	G	G	A	C	A	A	C	G	C	C	A	A	G	A	A	C	T	C
UAM:	G	A	C	T	C	T	G	T	G	A	A	G	G	G	C	C	G	A	T	T	C	A	C	C	A	T	C	T	C	C	A	G	G	G	A	C	A	A	C	G	C	C	A	A	G	A	A	C	T	C
HUM:	A	C	T	G	T	A	T	C	T	G	C	A	A	A	T	G	A	A	C	A	G	C	C	T	G	A	G	A	G	C	C	G	A	G	G	A	C	A	C	G	G	C	C	G	T	G	T	A	T	T
UAM:	A	C	T	G	T	A	T	C	T	G	C	A	A	A	T	G	A	A	C	A	G	C	C	T	G	A	G	A	G	T	C	G	A	G	G	A	C	A	C	G	G	C	T	G	T	G	T	A	T	T
HUM:	A	C	T	G	T	G	-	-	-	-	-	C	G	A	G	A	G	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UAM:	A	C	T	G	T	G	T	G	A	A	A	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	G	A	C	A	C	A	A	A	C	C	T
UAM:	G	A	C	A	C	A	A	A	C	C	T

IGHV3-7

GENE ALIGN SEQ

HUM: A T G G A A T T G G G G C T G A G C T G G G T T T T C C T T G T T G C T A T T T T A G A A G G T G A
UAM: A T G G A G T T G G G G C T G A G C T G G G T T T T C C T T G T T G C T A T T T T A G A A G G T G A

HUM: T T C A T G - - G A A A A C T A G G A A G A T T G A G T G T G T G T G G A T A T G A G T G T G A G A
UAM: T T C - - G T T G A A A A C T A G G A A G A T T G A G T G T G A G T A G A T A T G A G T G A G A G A

HUM: A A C A G T G G A T T T G T G T G G C A G T T T C T G A C C - T T G G - T G T C T C T T T G T T T G
UAM: A A C A G T G G A T T T G T G T G G C A G T T T C T G A C C A - - - G A T G T C T C T T T G T T T G

HUM: C A G G T G T C C A G T G T G A G G T G C A G C T G G T G - G A G T C T G G G G G A G G C T T G G T
UAM: C A G G T G T C C A G T G T G A G G T G C A G C T G G T G C G - G T C T G G G G G A G G C T T G G T

HUM: C C A G C C T G G G G G T C C C T G A G A C T C T C C T G T G C A G C C T C T G G A T T C A C C T
UAM: A C A G C C T G G G G G T C C C T G A G A C T C T C C T G T G C A G C C T C T G G A T T C A C C T

HUM: T T A G T A G C T A T T G G A T G A G C T G G G T C C G C C A G G C T C C A G G G A A G G G G C T G
UAM: T T A G T A G C T A C T G G A T G A G C T G G G T C C G C C A G G C T C C A G G G A A A G G G C T G

HUM: G A G T G G G T G G C C A A C A T A A A G C A A G A T G G A A G T G A G A A A T A C T A T G T G G A
UAM: G A G T G G G T G G C C A A C A T A A A G C A A G A T G G A A G T G A G A A A T A C T A T G T A G A

HUM: C T C T G T G A A G G G C C G A T T C A C C A T C T C C A G A G A C A A C G C C A A G A A C T C A C
UAM: C T C T G T G A A G G G C C G A T T C A C T A T C T C C G G A G A C A G C G C C A A G A A C T C G C

HUM: T G T A T C T G C A A A T G A A C A G C C T G A G A G C C G A G G A C A C G G C T G T G T A T T A C
UAM: T G T A T C T G C A A A T G A A C A G C C T G A G A G C C T A G G A C A C G G C T G T G T A T T A C

HUM: T G T G C - - - G A G A G A
UAM: T - - - C T A T G A G A G A

D7

HUM: C A C A G T G
UAM: C A C A G T G

D9

HUM: G A C A C A A A C C T
UAM: G A C A C A A A C C T

IGHV3-6

GENE ALIGN SEQ

HUM:	A	T	G	G	A	G	T	T	G	G	G	G	C	T	G	A	G	G	T	G	G	G	T	T	T	T	C	C	T	T	G	C	T	G	C	T	A	T	T	T	T	A	A	A	A	G	G	T	G	A
UAM:	A	T	G	G	A	G	T	T	G	G	G	G	C	T	G	A	G	G	T	G	G	G	T	T	T	T	C	C	T	T	G	C	T	G	C	T	A	T	T	T	T	A	A	A	A	G	G	T	G	G
HUM:	T	T	T	A	T	G	G	A	G	A	A	C	T	A	G	A	G	C	T	A	T	T	G	A	G	T	G	T	G	A	A	T	G	G	A	C	A	T	A	A	G	T	G	A	G	C	G	A	A	A
UAM:	T	T	T	A	T	G	G	A	G	A	A	C	T	A	G	A	G	A	T	A	T	T	G	A	G	T	G	T	G	A	A	T	G	G	A	C	A	T	A	A	G	T	G	A	G	A	G	A	A	A
HUM:	C	A	G	T	G	G	A	T	A	T	G	T	G	T	G	G	C	A	G	T	T	T	C	T	T	A	C	C	A	G	G	A	T	G	T	C	T	C	T	G	T	G	T	T	T	G	C	A	G	G
UAM:	C	A	G	T	G	G	A	T	A	T	G	T	G	T	A	G	C	A	G	T	T	T	C	T	T	A	C	C	A	G	G	A	T	G	T	C	T	C	T	G	T	T	T	T	T	G	C	A	G	G
HUM:	T	G	T	C	C	A	G	T	G	T	G	A	G	A	T	G	C	A	G	C	T	G	G	T	A	G	A	G	T	C	T	G	G	A	G	C	A	A	A	C	T	T	G	A	C	A	A	A	G	C
UAM:	T	G	T	C	C	A	G	T	G	T	G	A	G	A	T	G	C	A	G	C	T	G	G	T	A	G	A	G	T	C	T	G	G	A	G	G	A	A	A	C	T	T	G	A	C	A	A	A	G	C
HUM:	C	T	G	G	G	T	G	T	C	C	C	T	G	A	G	A	C	T	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	G	A	T	T	C	A	C	C	T	T	C	A	G	T	A
UAM:	C	T	G	G	G	T	G	T	C	T	C	T	G	A	G	A	C	G	C	T	C	C	T	G	T	G	C	A	G	C	C	T	C	T	G	T	A	T	T	C	A	C	C	T	T	C	A	G	T	A
HUM:	G	C	C	A	T	A	G	C	A	C	G	C	A	C	T	G	G	G	T	C	C	C	C	C	A	G	G	C	T	C	C	A	G	G	G	A	A	G	G	G	T	C	T	G	C	A	G	T	G	G
UAM:	G	C	C	A	T	A	G	C	A	C	G	C	A	C	T	G	G	T	T	C	C	C	C	C	A	G	G	C	T	C	C	A	G	G	G	A	A	G	G	G	T	C	T	G	C	A	G	T	G	G
HUM:	G	T	C	C	C	A	G	T	T	A	T	T	A	G	T	G	G	T	A	G	T	G	G	T	-	A	G	T	A	C	C	A	T	G	T	A	-	-	C	T	A	C	G	C	A	G	A	C	T	C
UAM:	G	T	C	T	C	A	G	T	T	A	T	T	A	G	T	A	G	T	A	G	T	A	G	T	T	A	-	T	A	C	C	A	T	-	-	A	T	T	C	T	A	C	G	C	A	G	A	C	T	C
HUM:	T	G	T	G	A	A	G	G	G	C	C	G	A	T	T	C	A	C	C	A	T	T	T	C	C	A	G	A	G	A	C	A	A	T	A	C	C	A	A	A	A	A	C	T	C	A	C	T	G	T
UAM:	T	G	T	G	A	A	G	G	G	C	T	G	A	T	T	C	A	C	C	A	T	T	T	C	C	A	G	A	G	A	C	A	A	T	A	C	C	A	A	A	A	A	C	T	C	A	C	A	G	T
HUM:	A	T	C	T	G	C	A	A	A	T	G	A	A	C	A	G	-	-	-	-	-	-	-	-	-	A	C	T	G	A	G	G	G	C	A	G	A	G	G	A	T	G	C	A	G	C	T	G	C	A
UAM:	A	T	C	T	G	C	A	A	A	T	G	A	A	C	A	G	C	C	T	G	A	G	A	G	C	-	C	T	G	A	G	G	A	C	-	-	-	-	-	A	T	G	-	-	G	C	T	G	T	G
HUM:	T	A	T	G	A	C	T	C	T	G	T	G	A	G	A	G	A																																	
UAM:	T	A	T	T	A	C	T	C	T	G	T	G	A	G	A	G	A																																	

D7

HUM:	T	A	C	G	G	T	A
UAM:	C	A	T	G	G	T	A

D9

HUM:	G	A	C	A	C	A	A	A	C	C	T
UAM:	A	C	A	A	A	C	C	T	C	C	C

IGHVIII-5-2

GENE ALIGN SEQ

HUM: A G C C T G G C T A T T C T C T T A G C T T C T T C T G C A A A G C A T C A A G A T T C A C C T T C
UAM: A G C C T G G C T A T T C T C T T T G C T T C T T C T G C A A A G C A T C A A G A T T C A C C T T C

HUM: A C T G A C T G C A G C A T T T A T T G G G C C C T G A T G G C T G G A G G A G A G G G G C T G G A
UAM: A C T G A C T A C A G C A T T T G T T G G G C C C A G A A G G C T G G A G G A G A G G G G C T G G A

HUM: G T G G G T G G T A G C C A T G A G T G A C C C A A G T G G A A G T T C T C A G T G G T G C T C T G
UAM: G T G G G T G G T A G C C A T G A G T G A C C C A A G T G G A A G T T C T C A G T G G T G C T C T G

HUM: C T C C A G C A C A A A G A A G A T T C A C A G T T C C T G G G G A C A A C A C T T A A C A T C A C
UAM: C C C C A G C A C A A A G A A G A T T C A C A G T T C C T G G G G A C A A C A C T T A A C A T C A C

HUM: A A T C T C C C T T A A A A T T A T C T A C T G G A A A G C T G A G G A G T A G G C A G T G T A T T
UAM: A A T C T C C C T T A A A A T T A T C T A C T T G A A A G C T G A G G A G T A G G C A G T G T A T T

HUM: A C T G T G A G A G A
UAM: A C T G T G A G A G A

D7
HUM: C A C A G T G
UAM: C A C A G T G

D9
HUM: A C G C A A A C T T C
UAM: A C A C A A A C C T C

IGHVIII-5-1

GENE ALIGN SEQ

HUM:	G	A	T	T	T	A	T	C	A	T	C	T	C	A	A	G	A	G	A	C	A	A	T	G	T	C	A	A	G	A	A	G	A	T	G	C	T	G	T	T	T	C	T	G	C	A	A	A	T	G
UAM:	G	A	T	T	T	A	T	C	A	T	C	T	C	A	A	G	A	G	A	C	A	A	T	G	T	C	A	A	G	A	A	G	A	T	G	C	T	G	T	T	T	C	T	G	C	A	A	A	T	G

HUM:	G	G	C	A	A	T	C	T	G	C	A	A	A	C	C	A	A	G	G	A	C	A	C	G	T	C	A	C	T	A	C	A	T	T	A	C	T	G	T	G	C	A	A	G	A	G	A	A	G
UAM:	G	G	C	A	A	T	C	T	G	C	A	A	A	C	C	A	A	G	G	A	C	A	C	G	T	C	A	C	T	A	T	A	T	T	A	C	T	G	T	G	C	A	A	G	A	G	A	A	G

D7

HUM:	C	A	C	A	T	G	A
UAM:	C	G	C	A	T	G	A

D9

HUM:	A	A	C	C	T	C	C	A	G	G	A
UAM:	A	A	A	C	T	C	C	A	G	G	G

IGHV2-5

GENE ALIGN SEQ

HUM:	A	T	G	G	A	C	A	C	A	C	T	T	T	G	C	T	C	C	A	C	G	C	T	C	C	T	G	C	T	G	C	T	G	A	C	C	A	T	C	C	C	T	T	C	A	T	G	T	G	A	
UAM:	A	T	G	G	A	C	A	C	A	C	T	T	T	G	C	T	C	C	A	C	G	C	T	C	C	T	G	C	T	G	C	T	G	A	C	C	G	T	C	C	C	T	T	C	C	T	G	T	G	A	
HUM:	G	T	G	C	T	G	T	G	G	T	C	A	G	G	G	A	C	T	C	C	T	T	C	A	C	G	G	G	-	T	G	A	A	A	C	A	T	C	A	G	T	T	T	C	T	-	T	-	-		
UAM:	G	T	G	C	T	G	T	G	G	T	G	A	G	G	G	A	C	T	C	C	C	T	C	A	-	G	G	G	A	T	A	A	A	A	C	A	T	C	T	G	-	-	T	T	C	T	C	T	C	C	
HUM:	G	T	T	T	G	T	G	G	G	C	T	T	C	A	T	C	T	T	C	T	T	A	T	G	C	T	T	T	C	T	C	C	A	C	A	G	G	G	G	T	C	T	T	G	T	C	C	C	A	G	
UAM:	-	T	T	T	G	T	G	G	G	C	T	T	C	A	T	C	T	T	C	T	T	A	T	G	C	T	T	T	C	T	C	C	A	C	A	G	T	G	G	T	C	T	T	C	T	C	C	C	A	G	
HUM:	A	T	C	A	C	C	T	T	G	A	A	G	G	A	G	T	C	T	G	G	T	C	C	T	A	C	G	C	T	G	G	T	G	A	A	A	C	C	C	A	C	A	C	A	G	A	C	C	C	T	
UAM:	G	T	C	A	C	C	T	T	G	A	A	G	G	A	G	T	C	T	G	G	T	C	C	T	G	C	G	C	T	G	G	T	G	A	A	A	C	C	C	A	C	A	C	A	G	A	C	C	C	T	
HUM:	C	A	C	G	C	T	G	A	C	C	T	G	C	A	C	C	T	T	C	T	C	T	G	G	G	T	T	C	T	C	A	C	T	C	A	G	C	A	C	T	A	G	T	G	G	A	G	T	G	G	
UAM:	C	A	C	G	C	T	G	A	C	C	T	G	C	A	C	C	T	T	C	T	C	T	G	G	G	T	T	C	T	C	A	C	T	C	A	G	C	A	C	T	A	G	T	G	G	A	A	T	G	G	
HUM:	G	T	G	T	G	G	G	C	T	G	G	A	T	C	C	G	T	C	A	G	C	C	C	C	C	A	-	G	G	A	A	A	G	G	C	C	C	T	G	G	A	G	T	G	G	C	T	T	G	C	
UAM:	G	T	G	T	G	G	G	C	T	G	G	A	T	C	C	G	T	C	A	G	C	C	C	C	C	A	A	G	G	-	A	A	G	G	C	C	C	T	G	G	A	G	T	G	G	C	T	T	G	C	
HUM:	A	C	T	C	A	T	T	T	A	T	T	G	G	G	A	T	G	A	T	G	A	T	A	A	A	G	C	G	C	T	A	C	A	G	C	C	C	A	T	C	T	C	T	G	A	A	G	A	G	C	A
UAM:	A	G	T	C	A	T	T	T	A	T	T	G	G	G	A	T	G	A	T	G	A	T	A	A	A	G	C	G	C	T	A	C	A	G	C	C	C	A	T	C	T	C	T	G	A	A	G	A	G	C	A
HUM:	G	G	C	T	C	A	C	C	A	T	C	A	C	C	A	A	G	G	A	C	A	C	C	T	C	C	A	A	A	A	A	C	C	A	G	G	T	G	G	T	C	C	T	T	A	C	A	A	T	G	
UAM:	G	A	C	T	C	A	C	C	A	T	C	T	C	C	A	A	G	G	A	C	A	C	C	T	C	C	A	A	A	A	A	C	C	A	G	G	T	G	G	T	C	C	T	T	A	C	A	A	T	G	
HUM:	A	C	C	A	A	C	A	T	G	G	A	C	C	C	T	G	T	G	G	A	C	A	C	A	G	C	C	A	C	A	T	A	T	T	A	C	T	G	T	G	C	A	C	A	C	A	G	A	C		
UAM:	A	C	C	A	A	C	A	T	G	G	A	C	C	C	T	G	T	G	G	A	C	A	C	A	G	C	C	A	C	A	T	A	T	T	A	C	T	G	T	G	C	A	C	G	G	A	G	A	C		

D7

HUM:	C	A	C	A	A	A	G
UAM:	C	A	C	A	G	A	G

D9

HUM:	T	A	C	A	A	A	A	C	C	C	
UAM:	T	A	C	A	A	G	A	A	C	C	C

IGHV4-4

GENE ALIGN SEQ

HUM:	A	T	G	A	A	A	C	A	C	C	T	G	T	G	G	T	T	C	T	T	C	T	C	C	T	C	C	T	G	G	T	G	G	C	A	G	C	T	C	C	C	A	G	A	T	G	T	G	A		
UAM:	A	T	G	A	A	A	C	A	C	C	T	G	T	G	G	T	T	C	T	T	T	C	T	C	C	T	C	C	T	G	G	T	G	G	C	A	G	C	T	C	C	C	A	G	A	T	G	T	G	A	
HUM:	G	T	G	T	C	T	C	A	A	G	G	C	T	G	C	A	G	A	C	A	T	G	G	G	G	T	A	T	G	G	G	A	G	G	T	G	C	C	T	C	T	G	A	T	C	C	C	A	G		
UAM:	G	T	G	T	C	T	C	A	A	G	G	C	T	G	C	A	G	A	C	A	T	G	G	A	G	A	T	A	T	G	G	G	A	G	G	T	G	C	C	T	C	T	G	A	G	C	C	C	A	G	
HUM:	G	G	C	T	C	A	C	T	G	T	G	G	G	T	C	T	C	T	C	T	G	T	T	C	A	C	A	G	G	G	G	T	C	C	T	G	T	C	T	C	A	G	G	T	G	C	A	G	C	T	
UAM:	G	G	C	T	C	A	C	T	G	T	G	G	G	T	C	T	C	T	C	T	G	T	T	C	A	C	A	G	G	G	G	T	C	C	T	G	T	C	C	C	A	G	G	T	G	C	A	G	C	T	
HUM:	G	C	A	G	G	A	G	T	C	G	G	G	C	C	C	A	G	G	A	C	T	G	G	T	G	A	A	G	C	C	T	T	-	C	G	G	G	-	G	A	C	C	C	T	G	T	C	C	C	T	
UAM:	G	C	A	G	G	A	G	T	C	G	G	G	C	C	C	A	G	G	A	C	T	G	G	T	G	A	A	G	C	C	T	T	T	-	-	G	G	A	G	A	C	C	C	T	G	T	C	C	C	T	
HUM:	C	A	C	C	T	G	C	G	C	T	G	T	C	T	C	T	G	G	T	G	G	C	T	C	C	A	T	C	A	G	C	A	G	T	A	G	T	A	A	C	T	G	G	T	G	G	A	G	T	T	
UAM:	C	A	C	C	T	G	C	G	C	T	G	T	C	T	C	T	G	G	T	G	G	C	T	C	C	A	T	C	A	G	C	A	G	T	A	G	T	A	A	C	T	G	G	T	G	G	A	G	C	T	
HUM:	G	G	G	T	C	C	G	C	C	A	G	C	C	C	C	C	A	G	G	G	A	A	G	G	G	C	T	G	G	A	G	T	G	G	A	T	T	G	G	G	G	A	A	A	T	C	T	A	T		
UAM:	G	G	G	T	C	C	G	C	C	A	G	C	C	C	C	C	A	G	G	G	A	A	G	G	C	C	T	G	G	A	G	T	G	G	A	T	T	G	G	G	G	A	A	A	T	C	T	A	T		
HUM:	C	A	T	A	G	T	G	G	G	A	G	C	A	C	C	A	A	C	T	A	C	A	A	C	C	C	G	T	C	C	C	T	C	A	A	G	A	G	T	C	G	A	G	T	C	A	C	C	A	T	
UAM:	C	A	A	A	G	T	G	G	G	A	G	C	A	C	C	A	A	C	T	A	C	A	A	C	C	C	G	T	C	C	C	T	C	A	A	G	A	G	T	C	G	A	G	T	C	A	C	C	A	T	
HUM:	A	T	C	A	G	T	A	G	A	C	A	A	G	T	C	C	A	A	G	A	A	C	C	A	G	T	T	C	T	C	C	C	T	G	A	A	G	C	T	G	A	G	C	T	C	T	G	T	G	A	
UAM:	A	T	C	A	G	T	A	G	A	C	A	C	G	T	C	C	A	A	G	A	A	C	C	A	G	T	T	C	T	C	C	C	T	G	A	A	G	C	T	G	A	G	C	T	C	T	G	T	G	A	
HUM:	C	C	G	C	C	G	C	G	G	A	C	A	C	G	G	C	C	G	T	G	T	A	T	T	A	C	T	G	T	G	C	G	A	G	A	G	A														
UAM:	C	C	G	C	C	G	C	G	G	A	C	A	C	G	G	C	C	G	T	G	T	A	T	T	A	C	T	G	T	G	C	G	A	G	A	G	A														

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	G	A	C	A	C	A	A	A	C	C	T
UAM:	G	T	C	A	C	A	A	A	C	C	T

IGHV1-3

GENE ALIGN SEQ

HUM:	A	T	G	G	A	C	T	G	G	A	C	C	T	G	G	A	G	G	A	T	C	C	T	C	T	T	T	T	T	G	G	T	G	G	C	A	G	C	A	G	C	C	A	C	A	G	G	T	A	A
UAM:	A	T	G	G	A	C	T	G	G	A	C	C	T	G	G	A	T	G	A	T	C	C	T	C	T	T	T	T	T	G	G	T	G	G	C	A	G	C	A	G	C	C	A	C	A	G	G	T	A	A
HUM:	G	G	G	G	C	T	G	C	C	A	A	A	T	C	C	C	A	G	T	G	A	G	G	A	G	G	A	A	G	G	G	A	T	C	G	A	G	G	C	C	A	G	T	C	A	A	G	G	G	G
UAM:	G	G	G	G	C	T	G	C	C	A	A	A	T	C	C	C	A	G	C	G	A	G	G	A	G	G	A	A	G	T	G	A	T	T	G	A	G	G	C	C	A	G	T	C	A	A	G	G	G	G
HUM:	A	A	T	T	C	C	A	T	C	C	A	C	T	C	C	T	G	T	G	T	C	T	T	C	T	C	T	A	C	A	G	G	T	G	C	C	C	A	C	T	C	C	C	A	G	G	T	C	C	A
UAM:	G	C	T	T	C	C	A	T	C	C	A	C	T	C	C	T	G	T	G	T	C	T	T	C	T	C	C	A	C	A	G	G	T	G	C	C	C	A	C	T	C	C	C	A	G	G	T	C	C	A
HUM:	G	C	T	T	G	T	G	C	A	G	T	C	T	G	G	G	G	C	T	G	A	G	G	T	G	A	A	G	A	A	G	C	C	T	G	G	G	G	C	C	T	C	A	G	T	G	A	A	G	G
UAM:	G	C	T	C	G	T	G	C	A	G	T	C	T	G	G	G	G	C	T	G	A	G	G	T	G	A	A	G	A	A	G	C	C	T	G	G	G	G	C	C	T	C	A	G	T	G	A	A	G	G
HUM:	T	T	T	C	C	T	G	C	A	A	G	G	C	T	T	C	T	G	G	A	T	A	-	-	-	-	-	C	A	C	C	-	T	T	C	A	C	T	A	G	C	T	-	A	T	G	C	T	A	
UAM:	T	C	T	C	C	T	G	C	A	A	G	G	C	T	T	C	T	G	G	A	T	A	T	A	C	C	T	T	C	A	C	C	G	-	-	-	A	C	T	A	-	C	T	T	-	-	-	-	T	A
HUM:	T	G	C	A	T	T	G	G	G	T	G	C	G	C	C	A	G	G	C	C	C	C	G	G	A	C	A	A	A	G	G	C	T	T	G	A	G	T	G	G	A	T	G	G	A	T	G	G		
UAM:	T	G	C	A	C	T	G	G	A	T	G	C	T	C	C	A	G	G	C	C	C	C	T	G	G	A	C	A	A	A	G	G	C	T	T	G	A	G	T	G	G	A	T	G	G	A	T	G	G	
HUM:	A	T	C	A	A	C	G	C	T	G	G	C	A	A	T	G	G	T	A	A	C	A	C	A	A	A	A	T	A	T	T	C	A	C	A	G	A	A	G	T	T	C	C	A	G	G	G	C	A	G
UAM:	A	T	C	A	G	C	G	C	T	G	G	C	A	A	T	G	G	T	A	A	C	A	C	A	A	A	A	T	A	T	T	C	A	C	A	G	A	A	G	T	T	C	C	A	G	G	G	C	A	G
HUM:	A	G	T	C	A	C	C	A	T	T	A	C	C	A	G	G	G	A	C	A	C	A	T	C	C	G	C	G	A	G	C	A	C	A	G	C	C	T	A	C	A	T	G	G	A	G	C	T	G	A
UAM:	A	G	T	C	A	C	C	A	T	T	A	C	C	A	G	A	G	A	C	A	C	G	T	C	C	G	C	G	A	G	C	A	C	A	G	C	C	T	A	C	A	T	G	G	A	G	C	T	G	A
HUM:	G	C	A	G	C	C	T	G	A	G	A	T	C	T	G	A	A	G	A	C	A	C	G	G	C	T	G	T	G	T	A	T	T	A	C	T	G	T	G	C	G	A	G	A	G	A				
UAM:	G	C	A	G	C	C	T	G	A	G	A	T	C	T	G	A	G	G	A	C	A	C	G	G	C	T	G	T	G	T	A	T	T	A	C	T	G	T	G	T	G	A	G	A	G	A				

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	G	T	C	A	G	A	A	A	C	C	C
UAM:	G	T	C	A	G	A	A	A	C	C	C

IGHVIII-2-1

GENE ALIGN SEQ

HUM: A A G T C C T G T G T G A A G T T T A C T G A T G G A G T C A G A G G G G G A A A A A T T T T A C A
UAM: A A G T C C T G T G T G A A G T T T A C T G A T G G A G T C A G A G G G A G A A A A A T T T T A C A

HUM: G C C C A G T G G - T G A G A C T C T C C T G C A A A G C C T C T G G T T T C A C C T T T A C T G G
UAM: G C C T A G C G G T T G A G A C T C T C C C G C A A A G C C T C T G G T T T C A C C T T T A C T G G

HUM: T T A C A G C A T G A G C T T G G T C C A G C A T G C T T C A C A A C A G G G A T A G G T G T G G G
UAM: C T A C C G C A T G A G C T T G G T C C A G C A T G C T T C A C A A C A G G G A T A G G T G T G G G

HUM: T G C C A A C A G T G A G T G A T C A A G T A T G A A T T C T C A G G G T T A C T C T C C A T G A G
UAM: T G C C A A C A G T G A G T G A T C A A G T A T G A A T T C T C A G G G T T A C T C T C C A T G A G

HUM: T A C A A A T A A A T T A A C A A T C T C A A G C A A C A C C C T T T T A A A G T G C A G T C T G C C
UAM: T A C A A A T A A A T T A A C A A T C T C A A G C A A C A C C C T T T T C A A G T G C A G T C T G C C

HUM: T T A C A A T G A C C A A T C T G A A A G C C A A G G A C A A G G T C A T G T A T T A C T G T G A G
UAM: T T A C A A T G A C C A A T C T G A A A G C C A A G G A C A A G G C C A T G T A T T A C - - T G A G

HUM: T G A
UAM: T G A

D7
HUM: C A C A G T G
UAM: C A C A G T G

D9
HUM: G A C A C A A A G C T
UAM: G A C A C A A A G C T

IGHV1-2

GENE ALIGN SEQ

HUM:	A	T	G	G	A	C	T	G	G	A	C	C	T	G	G	A	G	G	A	T	C	C	T	C	T	T	C	T	T	G	G	T	G	G	C	A	G	C	A	G	C	C	A	C	A	G	G	T	A	A
UAM:	A	T	G	G	A	C	T	G	G	A	C	C	T	G	G	A	G	G	A	T	C	C	T	C	T	T	C	T	T	G	G	T	G	G	C	A	G	C	A	G	C	T	A	C	A	G	G	T	A	A
HUM:	G	A	G	G	C	T	C	C	C	T	A	G	T	C	C	C	A	G	T	G	A	T	G	A	G	A	A	A	G	A	G	A	T	T	G	A	G	T	C	C	A	G	T	C	C	A	G	G	G	A
UAM:	G	A	G	T	C	T	C	C	C	T	A	G	T	C	C	C	A	G	T	G	A	T	G	A	G	A	A	A	G	A	G	A	T	T	G	A	G	T	C	C	A	G	T	C	C	A	G	G	G	A
HUM:	G	A	T	C	T	C	A	T	C	C	A	C	T	T	C	T	G	T	G	T	T	C	T	C	T	C	C	A	C	A	G	G	A	G	C	C	C	A	C	T	C	C	C	A	G	G	T	G	C	A
UAM:	G	A	T	C	T	C	A	T	C	C	A	C	T	C	C	T	G	T	G	C	C	C	T	C	T	C	C	A	C	A	G	G	T	G	C	C	C	A	C	T	C	C	C	A	G	G	T	C	C	A
HUM:	G	C	T	G	G	T	G	C	A	G	T	C	T	G	G	G	G	C	T	G	A	G	G	T	G	A	A	G	A	A	G	C	C	T	G	G	G	G	C	C	T	C	A	G	T	G	A	A	G	G
UAM:	G	C	T	G	G	T	G	C	A	G	T	C	T	G	G	G	G	C	T	G	A	G	G	T	G	A	A	G	A	A	A	C	C	T	G	G	G	A	C	C	T	C	A	G	T	G	A	A	G	A
HUM:	T	C	T	C	C	T	G	C	A	A	G	G	C	T	T	C	T	G	G	A	T	A	C	A	C	C	T	T	C	A	C	C	G	G	C	T	A	C	T	A	T	A	T	G	C	A	C	T	G	G
UAM:	T	C	T	C	C	T	G	C	A	A	G	G	C	T	T	C	T	G	G	T	T	A	C	A	C	C	T	T	C	A	C	C	A	G	C	T	A	C	T	A	T	A	T	G	C	A	C	T	G	G
HUM:	G	T	G	C	G	A	C	A	G	G	C	C	C	C	T	G	G	A	C	A	A	G	G	G	C	T	T	G	A	G	T	G	G	A	T	G	G	G	A	T	-	-	-	-	G	G	A	T	C	A
UAM:	G	T	G	C	G	A	C	A	G	G	C	C	C	C	T	G	G	A	C	A	G	G	G	G	C	T	T	G	A	G	T	G	G	A	T	-	-	-	-	T	G	G	A	C	G	G	A	T	C	A
HUM:	A	C	C	C	T	A	A	C	A	G	T	G	G	T	G	G	C	A	C	A	A	A	C	T	A	T	G	C	A	C	A	G	A	A	G	T	T	T	C	A	G	G	G	C	-	T	G	G	-	G
UAM:	A	C	C	C	T	A	A	C	A	G	T	G	G	T	A	A	C	A	C	A	A	A	C	T	A	C	G	C	A	C	A	G	A	A	G	T	T	T	C	A	G	G	G	C	A	-	-	G	A	G
HUM:	T	C	A	C	C	A	T	G	A	C	C	A	G	G	G	A	C	A	C	G	T	C	C	A	T	C	A	G	C	A	C	A	G	C	C	T	A	C	A	T	G	G	A	G	C	T	G	A	G	C
UAM:	T	C	G	C	C	A	T	G	A	C	C	A	G	G	G	A	C	A	C	G	T	C	C	A	T	C	A	G	C	A	C	A	G	C	C	T	A	C	A	T	G	G	A	G	C	T	G	A	G	A
HUM:	A	G	G	C	T	G	A	G	A	T	C	T	G	A	C	G	A	C	A	C	G	G	C	C	G	T	G	T	A	T	T	A	C	T	G	T	G	C	G	A	G	A	G	A						
UAM:	A	G	C	C	T	G	A	G	A	T	C	T	G	A	G	G	A	C	A	C	A	G	C	C	A	C	C	T	A	T	T	A	C	T	G	T	G	-	G	A	G	A	G	A						

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	G	T	C	A	G	A	A	A	C	C	C
UAM:	G	T	C	A	G	A	A	A	C	C	C

IGHVII-1-1

GENE ALIGN SEQ

HUM:	C	T	G	G	G	C	C	T	G	G	A	C	C	C	A	G	C	A	G	C	C	C	T	C	T	G	G	G	A	A	G	G	C	G	C	T	G	G	G	G	C	A	C	C	T	C	A	G	C	T		
UAM:	C	T	G	G	G	C	C	T	G	G	A	C	C	C	A	G	C	A	G	C	A	G	C	A	C	T	C	T	G	G	A	A	G	G	C	G	C	T	G	G	G	G	C	A	C	C	T	C	A	G	C	T
HUM:	C	C	A	G	G	G	G	C	A	G	C	A	C	A	C	A	C	T	T	C	A	G	C	C	C	A	G	C	C	T	T	T	C	T	G	G	G	C	C	A	A	C	T	C	T	C	C	A	T	C		
UAM:	C	C	A	G	G	G	G	C	A	G	C	A	C	A	C	A	C	T	T	C	A	G	C	C	C	A	-	C	C	C	T	T	C	T	G	G	G	C	C	A	A	C	T	G	T	C	C	A	T	C		
HUM:	T	G	T	A	G	A	G	A	C	A	C	A	T	C	C	A	A	G	G	C	C	C	A	G	T	T	A	T	C	C	C	T	G	C	A	G	C	T	G	A	G	C	T	C	C	G	T	G	A	T		
UAM:	T	G	C	A	G	A	G	A	C	A	C	A	T	C	C	A	A	G	G	C	C	C	A	G	T	T	A	T	C	T	C	T	G	C	A	G	C	T	G	A	G	C	T	C	C	G	T	G	A	C		
HUM:	G	G	C	C	A	A	G	G	G	C	A	G	G	G	C	C	G	C	A	C	A	T	T	C	C	C	G	T	G	G	G	A	G	A	C	A	G	A	A	T	G	G	G	G	A	C	C	T	C	A		
UAM:	G	G	C	C	A	C	G	G	G	C	A	G	G	G	C	C	A	C	A	C	A	T	T	C	C	C	A	T	G	G	A	A	G	A	C	A	G	C	A	C	G	G	G	G	A	C	C	T	C	A		
HUM:	G	C	G	T	G	A	G	C	C	C	A	G	A	C	A	C	A	A	A	C	C	T	C	C	C	T	G	C	A	G	G	G	A	A	G	C	A	C	A	A	G	A	C	C	A	C	C	A	G	G		
UAM:	G	T	G	T	G	A	G	C	C	C	A	G	A	C	A	C	A	A	A	T	C	T	C	C	C	T	G	C	A	G	G	G	A	A	G	C	A	T	A	A	G	A	C	C	A	C	C	A	G	G		
HUM:	C	G	G	C	G	C	T	C	C	A	G	A	C	C	A	C	A	-	-	-	C	A	G	C	G	G	C	C	C	C	A	G	A	A	G	C	A	G	G	T	T	T	T	A	G	G	G	G	C			
UAM:	C	G	G	C	G	C	T	C	C	A	G	A	C	C	A	C	A	A	G	A	G	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
HUM:	G	G	G	G	C	A	G	A	C	G	T	G	T	C	C	G	C	G	T	T	G	A	G	T	C	A	G	G	T	C	A	T	T	G	G	T	T	T	T	A	C	T	T	T	C	C	C	T	G	A		
UAM:	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
HUM:	G	C	A	A	A	C	G	G	C	C	T	C	T	G	C	C	A	A	G	G	A	C	T	C	A	C	T	G	C	A	C	C	T	C	T	C	A	C	C	T	T	C	A	C	A	G	T	T	G	T		
UAM:	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
HUM:	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	A	A	T	C	A	C	C	C	T	G	T	A	G	A	G	T	T	T	T	G	C	T	A	G	C	T	A	A	T	T	T	A	G		
UAM:	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
HUM:	A	T	A	T	T	G	A																																													
UAM:	-	-	-	-	-	-	-																																													
D7																																																				
HUM:	G	G	A	G	T	G	C																																													
UAM:	A	A	G	A	A	A	A																																													
D9																																																				
HUM:	C	T	T	G	C	A	G	A	A	A	C																																									
UAM:	T	G	C	A	T	G	A	G	G	C	C																																									

IGHD1-1

U9

HUM:	C	A	G	A	T	T	C	T	G	A	A
UAM:	C	A	G	A	T	T	C	T	G	A	A

U7

HUM:	C	A	C	G	G	T	G
UAM:	C	A	C	A	G	T	G

GENE ALIGN SEQ

HUM:	G	G	T	A	C	A	A	C	T	G	G	A	A	C	G	A	C
UAM:	G	G	T	A	T	A	A	C	T	G	G	A	A	T	G	A	C

D7

HUM:	C	A	C	C	G	T	G
UAM:	C	A	C	T	G	T	G

D9

HUM:	G	T	C	C	A	A	A	A	C	T	G
UAM:	G	T	C	C	A	A	A	A	C	T	G

IGHD2-2

U9

HUM:	A	G	G	A	T	T	T	T	G	T	G
UAM:	A	G	G	A	T	T	T	T	G	T	G

U7

HUM:	C	A	C	T	G	T	G
UAM:	C	A	C	T	G	T	G

GENE ALIGN SEQ

HUM:	A	G	G	A	T	A	T	T	G	T	A	G	T	A	G	T	A	C	C	A	G	C	T	G	C	T	A	T	G	C	C
UAM:	A	G	G	A	T	A	T	T	G	T	A	G	T	G	G	T	G	G	T	A	G	C	T	G	C	T	A	T	A	C	C

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	T	T	C	C	C	A	A	A	G	C	C
UAM:	T	T	C	C	C	A	A	A	G	C	C

IGHD3-3

U9

HUM:	A	G	G	T	T	T	G	G	G	G	T
UAM:	A	G	G	T	T	T	G	G	G	G	T

U7

HUM:	C	A	C	T	G	T	G
UAM:	C	A	C	T	G	T	G

GENE ALIGN SEQ

HUM:	G	T	A	T	T	A	C	G	A	T	T	T	T	T	G	G	A	G	T	G	G	T	T	A	T	T	A	T	A	C	C
UAM:	G	T	A	T	T	A	C	T	A	T	A	G	T	T	G	G	G	G	T	A	G	T	T	A	T	T	A	T	A	A	C

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	A	T	C	A	A	A	A	A	C	C	C
UAM:	A	T	C	A	A	A	A	A	C	C	C

IGHD4-4

U9

HUM:	G	G	C	T	T	T	T	T	G	T	G
UAM:	G	G	C	T	T	T	T	T	G	T	G

U7

HUM:	T	A	C	T	G	T	G
UAM:	T	G	C	T	G	T	G

GENE ALIGN SEQ

HUM:	T	G	A	C	T	A	C	A	G	T	A	A	C	T	A	C
UAM:	T	G	A	C	T	A	C	G	G	T	G	A	C	T	A	C

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	A	G	C	A	A	A	A	A	C	T	G
UAM:	G	G	C	A	A	A	A	A	C	T	A

IGHD5-5

U9

HUM:	T	G	G	T	T	A	T	T	G	T	C
UAM:	T	G	G	T	T	A	T	T	G	T	C

U7

HUM:	G	A	C	T	G	T	G
UAM:	G	A	C	T	G	T	G

GENE ALIGN SEQ

HUM:	G	T	G	G	A	T	A	C	A	G	C	T	A	T	G	-	-	-	-	-	-	G	T	T	A	C
UAM:	G	T	G	-	-	-	A	-	A	-	-	T	A	T	G	G	C	T	A	C	G	G	T	T	A	C

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	A	G	C	A	G	C	A	A	C	C	A
UAM:	A	G	C	A	G	C	A	A	C	C	A

IGHD6-6

U9

HUM:	A	A	G	T	T	T	C	T	G	A	A
UAM:	A	A	G	T	T	T	C	T	G	A	A

U7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

GENE ALIGN SEQ

HUM:	G	A	G	T	A	T	A	G	C	A	G	C	T	C	G	T	C	C
UAM:	G	A	G	T	A	T	A	G	C	A	G	C	T	G	G	T	A	C

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	G	C	C	A	G	A	A	A	C	C	C
UAM:	G	C	C	A	G	A	A	A	C	C	C

IGHD1-7

U9

HUM:	C	G	G	A	T	T	C	T	G	A	A
UAM:	C	G	G	A	T	T	C	T	G	A	A

U7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

GENE ALIGN SEQ

HUM:	G	G	T	A	T	A	A	C	T	G	G	A	A	C	T	A	C
UAM:	G	G	T	A	T	A	A	C	T	G	G	A	A	C	T	A	C

D7

HUM:	C	A	C	T	G	T	G
UAM:	C	A	C	T	G	T	G

D9

HUM:	G	T	C	C	A	A	A	A	C	G	G
UAM:	G	T	C	C	A	A	A	A	C	T	G

IGHD2-8

U9

HUM:	A	G	G	A	T	T	T	T	G	T	G
UAM:	A	G	G	A	T	T	T	T	G	T	G

U7

HUM:	C	A	C	T	G	T	G
UAM:	C	A	C	T	G	T	G

GENE ALIGN SEQ

HUM:	A	G	G	A	T	A	T	T	G	T	A	C	T	G	G	T	G	G	T	G	-	T	A	-	-	T	G	C	T	A	T	A	C	C
UAM:	A	G	G	A	T	A	T	T	G	T	A	-	-	-	G	T	G	G	T	G	G	T	A	G	C	T	G	C	T	A	C	G	C	C

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	T	T	C	C	C	A	A	A	G	C	C
UAM:	T	T	C	C	C	A	A	A	G	C	C

IGHD3-10

U9
HUM: A G G T T T G G G G T
UAM: A G G T T T G G G G T

U7
HUM: C A C T G T G
UAM: C A C T G T G

GENE ALIGN SEQ
HUM: G T A T T A C T A T G G T T C A G G G A G T - - - - - T A T T A T A A C
UAM: G T A T T A C T A T - - - - - A G T G G T G G T A C C T A T T A C A A C

D7
HUM: C A C A G T G
UAM: C A C A G T G

D9
HUM: A T C A A A A A C C C
UAM: A T C A A A A A C C C

IGHD4-11

U9

HUM:	G	G	C	T	T	T	T	T	G	T	G
UAM:	G	G	C	T	T	T	T	T	G	T	G

U7

HUM:	T	G	C	T	G	T	G
UAM:	T	A	C	T	G	T	G

GENE ALIGN SEQ

HUM:	T	G	A	C	T	A	C	A	G	T	-	-	-	A	A	C	T	A	C
UAM:	T	G	A	C	T	A	C	A	G	T	G	C	T	A	A	C	T	A	C

D7

HUM:	C	A	T	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	G	G	C	A	A	A	A	A	C	T	G
UAM:	A	G	C	A	A	A	A	A	C	T	G

IGHD5-12

U9
HUM: T G G T T A T T G T C
UAM: T G G T T A T T G T C

U7
HUM: G A C T G T G
UAM: G G C C G T G

GENE ALIGN SEQ
HUM: G T G G A T A T A G - T G G C T A C G A T T A C
UAM: G T G G A - - - G A T G G C T A C A A T T A C

D7
HUM: C A C A G T G
UAM: C A C A G T G

D9
HUM: A G C A G C A A C C A
UAM: A G C A G C A A C C A

IGHD6-13

U9

HUM:	A	G	G	T	T	T	C	T	G	A	A
UAM:	A	G	G	T	T	T	C	T	G	A	A

U7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

GENE ALIGN SEQ

HUM:	G	G	G	T	A	T	A	G	C	A	G	C	A	G	C	-	-	-	T	G	G	T	A	C
UAM:	G	G	G	T	A	T	A	G	C	A	G	C	A	G	C	A	G	C	T	G	G	T	A	C

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	G	C	C	A	G	A	A	A	C	C	C
UAM:	G	C	C	A	G	A	A	A	C	C	C

IGHD1-14

U9

HUM:	C	G	G	A	T	T	C	C	G	A	A
UAM:	C	A	G	A	T	T	C	T	G	A	A

U7

HUM:	C	A	C	A	G	C	G
UAM:	C	A	C	A	G	T	G

GENE ALIGN SEQ

HUM:	G	G	T	A	T	A	A	C	C	G	G	A	A	C	C	A	C
UAM:	G	G	T	T	T	A	A	C	T	G	G	A	A	C	T	A	C

D7

HUM:	C	A	C	T	G	T	C
UAM:	C	A	C	T	G	T	C

D9

HUM:	G	T	C	A	A	A	A	A	C	T	G
UAM:	G	T	C	A	A	A	A	A	C	T	G

IGHD2-15

U9

HUM:	A	G	G	A	T	T	T	T	G	T	G
UAM:	A	G	G	A	T	T	T	T	G	T	G

U7

HUM:	C	A	C	T	G	T	G
UAM:	C	A	C	T	G	T	G

GENE ALIGN SEQ

HUM:	A	G	G	A	T	A	T	T	G	T	A	G	T	G	G	T	G	G	T	A	-	-	-	G	C	T	G	C	T	A	C	T	C	C
UAM:	A	G	G	A	T	A	T	T	G	T	A	G	T	G	G	T	-	-	-	A	G	T	G	G	C	T	G	C	T	A	C	G	C	C

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	T	T	C	C	C	A	A	A	G	C	C
UAM:	C	T	C	C	C	A	A	A	G	C	C

IGHD3-16

U9

HUM:	A	G	G	T	T	T	G	A	A	G	T
UAM:	A	G	G	T	T	T	G	G	G	G	T

U7

HUM:	C	A	C	T	G	T	G
UAM:	C	A	C	T	G	T	G

GENE ALIGN SEQ

HUM:	G	T	A	T	T	A	T	G	A	T	T	A	C	A	T	T	T	G	G	G	G	A	G	T	T	A	T	C	G	T	T	A	T	A	C	C	
UAM:	G	T	A	T	-	-	-	G	A	T	T	A	T	G	T	T	T	G	G	G	G	A	A	G	T	T	A	T	C	G	T	T	A	T	A	C	C

D7

HUM:	C	A	C	A	G	C	A
UAM:	C	A	C	A	G	C	A

D9

HUM:	A	T	C	A	G	A	A	A	C	C	C
UAM:	A	T	C	A	A	A	A	A	C	C	C

IGHD4-17

U9

HUM:	G	G	C	T	T	T	T	T	G	T	G
UAM:	G	G	C	T	T	T	T	T	G	T	G

U7

HUM:	T	A	C	T	G	T	G
UAM:	T	A	C	T	G	T	G

GENE ALIGN SEQ

HUM:	T	G	A	C	T	A	C	G	G	T	G	A	C	T	A	C
UAM:	T	G	G	C	T	A	C	A	G	T	A	A	C	T	C	C

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	A	G	C	A	A	A	A	A	C	T	G
UAM:	G	G	G	A	A	A	A	A	C	T	G

IGHD5-18

U9

HUM:	T	G	G	T	T	A	T	C	G	T	C
UAM:	T	G	G	T	T	A	T	T	G	T	C

U7

HUM:	G	A	C	T	G	T	G
UAM:	G	A	C	T	G	T	G

GENE ALIGN SEQ

HUM:	G	T	G	A	A	T	A	T	A	G	T	G	G	C	T	A	C	G	A	T	T	A	C
UAM:	G	T	G	G	A	T	A	T	A	C	T	G	G	C	T	A	C	G	G	T	T	A	C

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	A	G	C	A	G	C	A	A	C	C	A
UAM:	A	G	C	G	G	C	A	A	C	C	A

IGHD6-19

U9

HUM:	A	G	G	T	T	T	C	T	G	A	A
UAM:	A	G	G	T	T	T	C	T	G	A	A

U7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

GENE ALIGN SEQ

HUM:	G	G	G	T	A	T	A	G	C	A	G	T	G	G	C	T	G	G	T	A	C
UAM:	G	G	G	T	A	T	A	G	C	A	G	C	G	G	C	T	G	G	T	C	C

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	G	C	C	A	G	A	A	A	C	C	C
UAM:	G	C	C	A	G	A	A	A	C	C	C

IGHD1-20

U9

HUM:	C	G	G	A	T	T	C	T	G	A	A
UAM:	C	A	G	A	T	T	C	T	G	A	A

U7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

GENE ALIGN SEQ

HUM:	G	G	T	A	T	A	A	C	T	G	G	A	A	C	G	A	C
UAM:	G	G	T	A	T	A	A	C	T	G	G	A	A	T	G	A	T

D7

HUM:	C	A	C	C	G	T	G
UAM:	C	A	C	T	G	T	G

D9

HUM:	G	T	C	C	A	A	A	A	C	T	G
UAM:	A	T	C	C	A	A	A	A	C	T	G

IGHD2-21

U9

HUM:	A	G	G	A	T	T	T	T	G	T	G
UAM:	A	G	G	A	T	T	T	T	G	T	G

U7

HUM:	C	A	C	T	G	T	G
UAM:	C	A	C	T	G	T	G

GENE ALIGN SEQ

HUM:	A	G	C	A	T	A	T	T	G	T	-	-	-	G	G	T	G	G	T	G	A	-	-	T	T	G	C	T	A	T	T	C	C
UAM:	A	G	G	A	T	A	T	T	G	T	A	G	T	G	G	T	G	G	T	-	A	G	C	-	T	G	C	T	A	C	G	C	C

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	T	T	C	C	T	A	A	A	G	C	C
UAM:	T	T	C	C	C	A	A	A	G	C	C

IGHD3-22

U9
HUM: A G G T T T G A A G T
UAM: A G G T T T G A A G T

U7
HUM: C A C T G T G
UAM: C A C T G T G

GENE ALIGN SEQ
HUM: G T A T T A - - - - C T A T G A T A G T A G T G G - - T T A T T A C T A - - - - - C
UAM: G T A T T A T G A T - T A T G A T A C T - - T G G G G - - - T T A C T A T T A A A G C

D7
HUM: C A C A G T G
UAM: C A C A G T G

D9
HUM: A T C A A A A A C T C
UAM: A T C A A A A A C T C

IGHD4-23

U9

HUM:	G	G	C	T	T	T	T	T	G	T	G
UAM:	G	G	C	T	T	T	T	T	G	T	G

U7

HUM:	T	G	C	T	G	T	G
UAM:	T	A	C	T	G	T	T

GENE ALIGN SEQ

HUM:	T	G	A	C	T	A	C	G	G	T	G	G	T	A	A	C	T	C	C
UAM:	T	G	A	C	T	A	C	G	G	T	G	G	T	A	A	C	T	C	C

D7

HUM:	C	A	C	A	G	T	G
UAM:	T	A	C	A	G	T	G

D9

HUM:	A	G	C	A	A	A	A	A	C	T	G
UAM:	G	G	C	A	A	A	A	A	C	T	G

IGHD5-24

U9

HUM:	T	G	G	T	T	A	T	T	G	T	C
UAM:	T	T	A	T	T	G	T	C	A	G	G

U7

HUM:	G	G	C	C	G	T	G
UAM:	C	A	T	G	G	T	G

GENE ALIGN SEQ

HUM:	G	T	A	G	A	G	A	T	G	G	C	T	A	C	A	A	T	T	A	C
UAM:	-	-	-	G	A	G	A	T	G	G	C	T	A	C	A	A	T	T	A	C

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	C	A	G	T	G

D9

HUM:	A	G	C	A	G	C	A	A	C	C	A
UAM:	A	G	C	A	G	C	A	A	C	C	A

IGHD6-25

U9

HUM:	A	G	G	T	T	T	C	T	G	A	A
UAM:	A	G	G	T	T	T	C	C	G	A	A

U7

HUM:	C	G	C	A	G	T	C
UAM:	C	A	C	A	G	T	G

GENE ALIGN SEQ

HUM:	G	G	G	T	A	T	A	G	C	A	G	C	G	G	C	T	A	C
UAM:	G	G	G	T	A	T	A	G	C	A	G	T	G	G	C	T	A	C

D7

HUM:	C	A	C	A	A	T	G
UAM:	C	A	C	A	A	T	G

D9

HUM:	G	A	C	A	G	A	A	T	C	C	C
UAM:	G	A	C	A	G	A	A	A	C	C	C

IGHD1-26

U9

HUM:	T	G	G	A	T	T	C	T	G	A	A
UAM:	T	G	G	A	T	T	C	T	G	A	A

U7

HUM:	C	A	C	G	G	T	G
UAM:	C	A	T	G	G	T	G

GENE ALIGN SEQ

HUM:	G	G	T	A	T	A	G	T	G	G	G	A	G	C	T	A	C	T	A	C
UAM:	G	G	T	A	T	A	G	T	G	G	G	A	G	C	T	A	C	T	A	C

D7

HUM:	C	A	C	T	G	T	G
UAM:	C	A	C	T	G	T	G

D9

HUM:	G	T	C	C	A	A	A	A	C	T	G
UAM:	G	T	C	C	A	A	A	A	C	T	G

IGHD7-27

U9

HUM:	G	G	G	T	T	T	T	G	G	C	T
UAM:	G	G	G	T	T	T	T	G	G	C	T

U7

HUM:	C	A	C	T	G	T	G
UAM:	C	A	C	C	G	T	G

GENE ALIGN SEQ

HUM:	C	T	A	A	C	T	G	G	G	G	A
UAM:	C	T	A	A	C	T	G	G	G	G	A

D7

HUM:	C	A	C	A	G	T	G
UAM:	C	A	G	A	G	T	G

D9

HUM:	T	A	C	A	A	A	A	A	C	C	A
UAM:	T	A	C	A	A	A	A	A	C	C	A

IGHJ1P

U9

HUM:	C	A	C	G	T	G	T	T	T	T	G
UAM:	C	G	T	G	T	G	T	T	T	T	G

U7

HUM:	C	A	C	T	G	G	C
UAM:	C	A	C	T	G	G	C

GENE ALIGN SEQ

HUM:	A	A	A	G	G	T	G	C	T	G	G	G	G	G	C	C	C	C	T	G	G	A	C	C	C	G	A	C	C	C	T	G	G	A	G	A	C	C	G	C	A	G	C	C	A	C				
UAM:	A	A	A	G	G	T	G	C	T	G	G	G	G	G	C	C	C	C	T	G	G	A	C	C	T	G	A	C	C	C	G	C	C	C	T	G	G	A	G	A	C	C	A	C	A	G	C	C	A	G

HUM:	A	T	C	A
UAM:	A	C	C	A

IGHJ1

U9

HUM:	T	G	G	G	T	T	T	C	T	G	T
UAM:	T	G	G	G	T	T	T	C	T	G	C

U7

HUM:	C	A	C	C	G	T	G
UAM:	C	A	C	C	G	T	G

GENE ALIGN SEQ

HUM:	G	C	T	G	A	A	T	A	C	T	T	C	C	A	G	C	A	C	T	G	G	G	G	C	C	A	G	G	G	C	A	C	C	C	T	G	G	T	C	A	C	C	G	T	C	T	C	C	T	C
UAM:	G	C	C	G	A	A	T	A	C	T	T	C	A	A	G	C	A	C	T	G	G	G	G	C	C	A	G	G	G	C	A	T	C	C	T	G	G	T	C	A	C	C	G	T	C	T	C	C	T	C

HUM:	A	G	G	T
UAM:	A	G	G	T

IGHJ2

U9

HUM:	T	G	T	G	T	T	T	T	T	G	T
UAM:	T	G	T	G	T	T	T	T	T	G	T

U7

HUM:	G	G	C	T	G	T	G
UAM:	G	G	C	T	G	T	G

GENE ALIGN SEQ

HUM:

C

T

A

C

T

G

G

T

A

C

T

T

C

G

A

T

C

T

C

T

G

G

O

G

C

C

G

T

G

G

C

A

C

C

C

T

G

G

T

C

A

C

T

G

T

C

T

C

C

T

UAM:

C

T

A

C

T

T

G

T

A

C

T

T

C

G

A

T

C

T

C

T

G

G

G

G

C

C

G

T

G

G

C

A

C

C

C

T

G

G

T

C

A

C

C

G

T

C

T

C

C

T

HUM:

C

A

G

G

T

UAM:

C

A

G

G

T

IGHJ2P

U9

HUM:	G	C	T	G	T	T	C	A	T	G	T
UAM:	G	C	T	G	T	T	C	A	T	G	T

U7

HUM:	T	A	G	T	G	T	G
UAM:	T	A	G	T	G	T	G

GENE ALIGN SEQ

HUM:

G

C

T

A

C

A

A

G

T

G

C

T

T

G

G

A

G

C

A

C

T

G

G

G

G

C

C

A

G

G

G

C

A

G

C

C

C

G

G

C

C

A

C

C

G

T

C

T

C

C

UAM:

G

C

T

A

C

A

A

G

T

A

C

T

T

G

G

A

G

C

A

C

T

G

G

G

T

C

C

A

G

G

G

C

A

G

C

C

C

G

G

C

C

A

C

C

G

T

C

T

C

C

HUM:

C

T

G

G

G

A

A

C

G

T

UAM:

C

T

G

G

G

A

A

C

T

T

IGHJ3

U9
HUM: A G G T T T G T G T C
UAM: G G G T T T G T G T C

U7
HUM: C C C T G T G
UAM: C C C T G T G

GENE ALIGN SEQ
HUM: T G A T G C T T T T G A T A T C T G G G G C C A A G G G - - A C - A A T G G T C A C C G T C T C T T
UAM: T G A T G C T T T T G A T A T C T G G G G C C T A G G G G T - C G - - T G G T C A C C G T C T C T T

HUM: C A G G T
UAM: C A G G T

IGHJ4

U9

HUM:	A	G	G	T	T	T	T	T	G	T	G
UAM:	A	G	G	T	T	T	T	T	G	T	G

U7

HUM:	C	A	A	T	G	T	G
UAM:	C	A	A	T	G	T	G

GENE ALIGN SEQ

HUM:	A	C	T	A	C	T	T	T	G	A	C	T	A	C	T	G	G	G	G	C	C	A	G	G	G	A	A	C	C	C	T	G	G	T	C	A	C	C	G	T	C	T	C	C	T	C	A	G	G	T
UAM:	A	C	T	A	C	T	T	T	G	A	G	T	A	C	T	G	G	G	G	C	C	A	G	G	G	A	A	C	C	C	T	G	C	T	C	A	C	C	G	T	C	T	C	C	T	C	A	G	G	T

IGHJ5

U9

HUM:	C	A	G	T	T	C	T	T	G	C	C
UAM:	C	A	G	T	T	C	T	T	G	C	C

U7

HUM:	C	A	A	T	G	T	G
UAM:	C	A	A	T	G	T	G

GENE ALIGN SEQ

HUM:	A	C	A	A	C	T	G	G	T	T	C	G	A	C	C	C	C	T	G	G	G	G	C	C	A	G	G	G	A	A	C	C	C	T	G	G	T	C	A	C	C	G	T	C	T	C	C	T	C	A
UAM:	A	C	A	A	C	C	A	G	T	T	C	G	A	C	C	C	C	T	G	G	G	G	C	C	A	G	G	G	A	A	C	C	C	T	G	G	T	C	A	C	C	G	T	C	T	C	C	C	A	

HUM:	G	G	T
UAM:	G	G	T

IGHJ3P

U9

HUM:	G	G	G	G	T	T	T	T	T	G	G
UAM:	A	G	G	A	T	T	T	T	T	G	G

U7

HUM:	C	C	G	T	C	T	G
UAM:	C	C	G	T	C	T	G

GENE ALIGN SEQ

HUM:	C	T	T	G	C	A	G	T	T	G	G	A	C	T	T	C	C	C	A	G	G	C	C	G	A	C	A	G	T	G	G	T	C	T	G	G	C	T	T	C	T	G	A	G	G	G	G	T	C	A
UAM:	C	T	T	G	C	A	G	T	T	G	G	A	C	T	T	C	C	C	A	G	G	C	T	G	A	C	A	G	T	G	G	T	C	T	G	G	C	T	T	C	T	G	A	G	G	G	G	T	C	A

HUM:	G
UAM:	G

IGHJ6

U9

HUM:	T	G	G	G	T	T	T	T	T	G	T
UAM:	T	G	G	G	T	T	T	T	T	G	T

U7

HUM:	C	A	T	T	G	T	G
UAM:	C	A	T	T	G	T	G

GENE ALIGN SEQ

HUM:	A	T	T	A	C	T	A	C	T	A	C	T	A	C	G	G	T	A	T	G	G	A	C	G	T	C	T	G	G	G	-	G	C	C	-	A	A	G	G	G	A	C	C	A	C	G	G	
UAM:	A	T	T	A	C	T	A	C	-	-	-	-	-	-	-	G	G	T	A	T	G	G	A	C	T	T	C	T	G	G	G	A	-	-	C	T	A	A	G	G	G	A	C	C	A	T	G	G

HUM:	T	C	A	C	C	G	T	C	T	C	C	T	C	A	G	G	T
UAM:	T	C	A	C	C	G	T	C	T	C	C	T	C	A	G	G	T