Claims

1. An antibody or an antigen-binding fragment thereof that binds to human immunodeficiency virus-1 (HIV-1) Envelope glycoprotein gp120, the antibody or antigen-binding fragment thereof comprising (i) a heavy chain variable region (VH) comprising VH complementary determining regions 1-3 (CDRs 1-3) and (ii) a light chain variable region (VL) comprising VL CDRs 1-3, wherein the VH CDRs 1-3 and VL CDRs 1-3 have the sequences set forth in:

(i) SEQ ID NOs.: 159, 138, 139, 140, 141, and 142, respectively;

(ii) SEQ ID NOs.: 137, 160, 139, 140, 141, and 142, respectively;

(iii) SEQ ID NOs.: 137, 161, 139, 140, 141, and 142, respectively;

(iv) SEQ ID NOs.: 137, 162, 139, 140, 141, and 142, respectively;

(v) SEQ ID NOs.: 137, 163, 139, 140, 141, and 142, respectively;

(vi) SEQ ID NOs.: 137, 138, 164, 140, 141, and 142, respectively;

(vii) SEQ ID NOs.: 159, 138, 164, 140, 141, and 142, respectively;

(viii) SEQ ID NOs.: 137, 138, 139, 140, 165, and 142, respectively;

(ix) SEQ ID NOs.: 137, 138, 139, 140, 166, and 142, respectively;

(x) SEQ ID NOs.: 137, 138, 139, 140, 167, and 142, respectively;

(xi) SEQ ID NOs.: 137, 138, 139, 140, 168, and 142, respectively;

(xii) SEQ ID NOs.: 137, 138, 154, 140, 141, and 142, respectively; or

(xiii) SEQ ID NOs.: 137, 138, 139, 140, 141, and 142, respectively; and wherein the antibody or antigen-binding fragment thereof ~~optionally~~ includes in framework region 3 (FR3) of the VH at position corresponding to 74a, 74b, 74c, and 74d (Kabat numbering) the amino acid sequence set forth in ~~SEQ ID NO:453 or~~ SEQ ID NO: 627.

2. The antibody or antigen-binding fragment thereof of claim 1, wherein the VH comprises one or more of the following amino acids at the indicated positions (position numbering according to Kabat): valine at position 5, glutamic acid at position 10, lysine at position 12, lysine at position 23, asparagine at position 28, arginine at position 30, tyrosine at position 32, threonine at position 68, methionine at position 69, histidine at position 72, phenylalanine at position 76, alanine at position 78, serine at position 82a, arginine at position 82b, threonine at position 89, tyrosine at position 99, glutamine at position 105, or methionine at position 108.

3. The antibody or antigen-binding fragment thereof of claim 1 or 2, wherein the ~~comprising~~ FR3 of the VH comprising the following amino acid sequence:

~~RVSLTRHASWDFDTFSFYMDLKALRSDDTAVYFCAR (SEQ ID NO: 628) or~~ RVSLTRHASFDFDTFSFYMDLKALRSDDTAVYFCAR (SEQ ID NO: 629).

~~4. The antibody or antigen-binding fragment thereof of any one of claims 1 to 3, wherein the VL comprises one or more of the following amino acids at the indicated positions (position numbering according to Kabat): arginine at position 18, lysine at position 39, proline at position 40, threonine at position 56, serine at position 65, threonine at position 72, serine at position 76, serine at position 77, threonine at position 99, glycine at position 99, asparagine at position 103, or isoleucine at position 106.~~

~~5~~4. The antibody or antigen-binding fragment thereof of any one of claims 1 to ~~4~~3, wherein the VL comprises one or more of the following amino acids at the indicated positions (position numbering according to Kabat): arginine at position 18, alanine at position 19, serine at position 65, threonine or histidine at position 72, lysine at position 74, serine at position 76, serine at position 77, phenylalanine at position 98, or glycine at position 99.

~~6. The antibody or antigen-binding fragment thereof of any one of claims 1 to 5, wherein the VL comprises an amino acid sequence set forth in any one of SEQ ID NOs.: 332 to 342.~~

~~7~~5. The antibody or antigen-binding fragment thereof of any one of claims 1 to ~~6~~4, comprising a human IgG1 Fc region.

~~8~~6. The antibody or antigen-binding fragment thereof of claim ~~7~~5, wherein the human IgG1 Fc region is IgG1m17 (SEQ ID NO: 348).

~~9~~7. The antibody or antigen-binding fragment thereof of any one of claims 1 to ~~8~~6, comprising a human IgG1 Fc region comprising (position numbered according to EU numbering):

(i) aspartic acid at position 239, glutamic acid at position 332, alanine at position 236, leucine at position 330;

(ii) aspartic acid at position 239, glutamic acid at position 332, leucine at position 428, and serine at position 434;

(iii) aspartic acid at position 239, glutamic acid at position 332, alanine at position 236, leucine at position 428, and serine at position 434;

(iv) aspartic acid at position 239, glutamic acid at position 332, leucine at position 330, leucine at position 428, and serine at position 434;

(v) aspartic acid at position 239, glutamic acid at position 332, alanine at position 236, leucine at position 330, leucine at position 428, and serine at position 434; or

(vi) leucine at position 243, proline at position 292, leucine at position 300, isoleucine at position 305, leucine at position 396, leucine at position 428, and serine at position 434.

~~10~~8. The antibody or antigen-binding fragment thereof of any one of claims 1 to ~~7~~5, comprising a human kappa light chain constant region.

~~11~~9. The antibody or antigen-binding fragment thereof of claim ~~10~~8, wherein the human kappa light chain constant region is Km3 (SEQ ID NO:351).

~~12. The antibody or antigen-binding fragment thereof of any one of claims 1 to 11, wherein the antibody or antigen-binding fragment has greater killing potency of HIV-infected cells than Antibody A.~~

~~13. The antibody or antigen-binding fragment thereof of any one of claims 1 to 12, wherein the antibody or antigen-binding fragment has an improved, extended, enhanced or increased serum half-life in a human than Antibody A.~~

~~14~~10. The antibody or antigen-binding fragment thereof of any one of claims 1 to ~~13~~9, wherein the antibody or antigen-binding fragment has a serum half-life in a human of at least about 3 days~~, *e.g.*, at least about 4 days, at least about 5 days, at least about 6 days, at least about 7 days, at least about 8 days, at least about 9 days, at least about 10 days, at least about 12 days, at least about 14 days, at least about 16 days, at least about 18 days, at least about 20 days, at least about 21 days, at least about 24 days, at least about 28 days, at least about 30 days, or longer~~.

~~15~~11. ~~An~~ The antibody ~~that binds to human immunodeficiency virus 1 (HIV-1) Envelope glycoprotein gp120~~of claim 1, the antibody comprising (i) a heavy chain variable region (VH) comprising VH complementary determining regions 1-3 (CDRs 1-3) and (ii) a light chain variable region (VL) comprising VL CDRs 1-3, wherein the VH CDRs 1-3 and VL CDRs 1-3 have the sequences set forth in:

(i) SEQ ID NOs.: 137, 138, 139, 140, 141, and 142, respectively; or

(ii) SEQ ID NOs.: 153, 138, 154, 140, 141, and 142, respectively,

wherein the antibody comprises a human IgG1 Fc region comprising (position numbered according to EU numbering):

(i) aspartic acid at position 239, glutamic acid at position 332, alanine at position 236, leucine at position 330;

(ii) aspartic acid at position 239, glutamic acid at position 332, leucine at position 428, and serine at position 434;

(iii) aspartic acid at position 239, glutamic acid at position 332, alanine at position 236, leucine at position 428, and serine at position 434;

(iv) aspartic acid at position 239, glutamic acid at position 332, leucine at position 330, leucine at position 428, and serine at position 434;

(v) aspartic acid at position 239, glutamic acid at position 332, alanine at position 236, leucine at position 330, leucine at position 428, and serine at position 434; or

(vi) leucine at position 243, proline at position 292, leucine at position 300, isoleucine at position 305, leucine at position 396, leucine at position 428, and serine at position 434~~.~~, and wherein the antibody comprises in framework region 3 (FR3) of the VH at positions corresponding to 74a, 74b, 74c, and 74d (Kabat numbering) the amino acid sequence set forth in SEQ ID NO: 627.

~~16~~12. The antibody of claim ~~15~~11, wherein the antibody comprises a light chain comprising an alanine at position 19 (Kabat numbering).

~~17. The antibody of any one of claims 15 to 16, comprising in framework region 3 (FR3) of the VH at positions corresponding to 74a, 74b, 74c, and 74d (Kabat numbering) the amino acid sequence set forth in SEQ ID NO:453 or SEQ ID NO: 627.~~

~~18~~13. The antibody of ~~any one of~~ claim~~s 15 to 17~~11, ~~comprising a~~wherein the FR3 of the VH comprising the following amino acid sequence: RVSLTRHASFDFDTFSFYMDLKALRSDDTAVYFCAR (SEQ ID NO: 629).

~~19. The antibody of any one of claims 15 to 18, wherein the antibody comprises a VL amino acid sequence set forth in any one of SEQ ID NOs.: 332 to 342.~~

~~20~~14. The antibody of any one of claims ~~15~~ 11 to ~~19~~13, wherein the human IgG1 Fc region is IgG1m17 (SEQ ID NO:348).

~~21~~15. The antibody of any one of claims ~~15~~ 11 to ~~20~~14, wherein the antibody comprises a human kappa light chain constant region.

~~22~~16. The antibody of claim ~~21~~15, wherein the human kappa light chain constant region is Km3 (SEQ ID NO:351).

~~23. The antibody of any one of claims 15 to 22, wherein the antibody has greater killing potency of HIV-infected cells than Antibody A and/or Antibody B.~~

~~24. The antibody or antigen-binding fragment thereof of any one of claims 15 to 23, wherein the antibody or antigen-binding fragment has an improved, extended, enhanced or increased serum half-life in a human than Antibody A and/or Antibody B.~~

~~25~~17. The antibody or antigen-binding fragment thereof of any one of claims ~~15~~ 11 to ~~24~~160, wherein the antibody or antigen-binding fragment has a serum half-life in a human of at least about 3 days~~, *e.g.*, at least about 4 days, at least about 5 days, at least about 6 days, at least about 7 days, at least about 8 days, at least about 9 days, at least about 10 days, at least about 12 days, at least about 14 days, at least about 16 days, at least about 18 days, at least about 20 days, at least about 21 days, at least about 24 days, at least about 28 days, at least about 30 days, or longer~~.

~~26~~18. ~~An~~ The antibody or an antigen-binding fragment thereof of claim 1, the antibody or antigen-binding fragment thereof comprising a heavy chain variable region (VH) and a light chain variable region (VL), wherein the VH and VL comprise the amino acid sequences set forth, respectively, below:

~~(1) SEQ ID NOs.: 184 and 223;~~
~~(2) SEQ ID NOs.: 185 and 223;~~
~~(3) SEQ ID NOs.: 182 and 225;~~
~~(4) SEQ ID NOs.: 185 and 225;~~
~~(5) SEQ ID NOs.: 186 and 223;~~
~~(6) SEQ ID NOs.: 187 and 223;~~
~~(7) SEQ ID NOs.: 188 and 223;~~
~~(8) SEQ ID NOs.: 189 and 223;~~
~~(9) SEQ ID NOs.: 190 and 223;~~
~~(10) SEQ ID NOs.: 191 and 223;~~
~~(11) SEQ ID NOs.: 192 and 223;~~
~~(12) SEQ ID NOs.: 193 and 223;~~
~~(13) SEQ ID NOs.: 194 and 223;~~
~~(14) SEQ ID NOs.: 195 and 223;~~

~~(15) SEQ ID NOs.: 196 and 223;~~

~~(16) SEQ ID NOs.: 197 and 223;~~

~~(17) SEQ ID NOs.: 198 and 223;~~

~~(18) SEQ ID NOs.: 199 and 223;~~

~~(19) SEQ ID NOs.: 200 and 223;~~

~~(20) SEQ ID NOs.: 201 and 223;~~

~~(21) SEQ ID NOs.: 202 and 223;~~

~~(22) SEQ ID NOs.: 203 and 223;~~

~~(23) SEQ ID NOs.: 204 and 223;~~

~~(24) SEQ ID NOs.: 205 and 223;~~

~~(25) SEQ ID NOs.: 206 and 223;~~

~~(26) SEQ ID NOs.: 207 and 223;~~

~~(27) SEQ ID NOs.: 208 and 223;~~

~~(28) SEQ ID NOs.: 209 and 223;~~

~~(29) SEQ ID NOs.: 182 and 226;~~

~~(30) SEQ ID NOs.: 182 and 227;~~

~~(31) SEQ ID NOs.: 182 and 229;~~

~~(32) SEQ ID NOs.: 182 and 230;~~

~~(33) SEQ ID NOs.: 182 and 231;~~

~~(34) SEQ ID NOs.: 182 and 232;~~

~~(35) SEQ ID NOs.: 182 and 233;~~

~~(36) SEQ ID NOs.: 182 and 234;~~

~~(37) SEQ ID NOs.: 182 and 235;~~

~~(38) SEQ ID NOs.: 182 and 236;~~

~~(39) SEQ ID NOs.: 182 and 237;~~

~~(40) SEQ ID NOs.: 182 and 238;~~

~~(41) SEQ ID NOs.: 182 and 239;~~

~~(42) SEQ ID NOs.: 182 and 240;~~

~~(43) SEQ ID NOs.: 182 and 241;~~

~~(44) SEQ ID NOs.: 182 and 242;~~

~~(45) SEQ ID NOs.: 182 and 243;~~

~~(46) SEQ ID NOs.: 182 and 244;~~

~~(47) SEQ ID NOs.: 182 and 245;~~

~~(48) SEQ ID NOs.: 182 and 246;~~

~~(49) SEQ ID NOs.: 182 and 247;~~

~~(50) SEQ ID NOs.: 182 and 248;~~

~~(51) SEQ ID NOs.: 182 and 249;~~

~~(52) SEQ ID NOs.: 182 and 250;~~

~~(53) SEQ ID NOs.: 182 and 251;~~

~~(54) SEQ ID NOs.: 182 and 252;~~

~~(55) SEQ ID NOs.: 182 and 253;~~

~~(56) SEQ ID NOs.: 210 and 238;~~

~~(57) SEQ ID NOs.: 211 and 238;~~

~~(58) SEQ ID NOs.: 212 and 238;~~

~~(59) SEQ ID NOs.: 210 and 240;~~

~~(60) SEQ ID NOs.: 211 and 240;~~

~~(61) SEQ ID NOs.: 212 and 240;~~

~~(62) SEQ ID NOs.: 213 and 223;~~

~~(63) SEQ ID NOs.: 214 and 223;~~

~~(64) SEQ ID NOs.: 215 and 223;~~

~~(65) SEQ ID NOs.: 216 and 223;~~

~~(66) SEQ ID NOs.: 217 and 223;~~

~~(67) SEQ ID NOs.: 218 and 223;~~

~~(68) SEQ ID NOs.: 182 and 254;~~

~~(69) SEQ ID NOs.: 213 and 254;~~

~~(70) SEQ ID NOs.: 214 and 254;~~

~~(71) SEQ ID NOs.: 215 and 254;~~

~~(72) SEQ ID NOs.: 216 and 254;~~

~~(73) SEQ ID NOs.: 217 and 254;~~

~~(74) SEQ ID NOs.: 218 and 254;~~

~~(75) SEQ ID NOs.: 182 and 255;~~

~~(76) SEQ ID NOs.: 213 and 255;~~

~~(77) SEQ ID NOs.: 214 and 255;~~

~~(78) SEQ ID NOs.: 215 and 255;~~

~~(79) SEQ ID NOs.: 216 and 255;~~

~~(80) SEQ ID NOs.: 217 and 255;~~

~~(81) SEQ ID NOs.: 218 and 255;~~

~~(82) SEQ ID NOs.: 182 and 256;~~

~~(83) SEQ ID NOs.: 213 and 256;~~

~~(84) SEQ ID NOs.: 214 and 256;~~

~~(85) SEQ ID NOs.: 215 and 256;~~

~~(86) SEQ ID NOs.: 216 and 256;~~

~~(87) SEQ ID NOs.: 217 and 256;~~

~~(88) SEQ ID NOs.: 218 and 256;~~

~~(89) SEQ ID NOs.: 182 and 257;~~

~~(90) SEQ ID NOs.: 213 and 257;~~

~~(91) SEQ ID NOs.: 214 and 257;~~

~~(92) SEQ ID NOs.: 215 and 257;~~

~~(93) SEQ ID NOs.: 216 and 257;~~

~~(94) SEQ ID NOs.: 217 and 257;~~

~~(95) SEQ ID NOs.: 218 and 257;~~

~~(96) SEQ ID NOs.: 182 and 258;~~

~~(97) SEQ ID NOs.: 213 and 258;~~

~~(98) SEQ ID NOs.: 214 and 258;~~

~~(99) SEQ ID NOs.: 215 and 258;~~

~~(100) SEQ ID NOs.: 216 and 258;~~

~~(101) SEQ ID NOs.: 217 and 258;~~

~~(102) SEQ ID NOs.: 218 and 258;~~

~~(103) SEQ ID NOs.: 182 and 259;~~

~~(104) SEQ ID NOs.: 213 and 259;~~

~~(105) SEQ ID NOs.: 214 and 259;~~

~~(106) SEQ ID NOs.: 215 and 259;~~

~~(107) SEQ ID NOs.: 216 and 259;~~

~~(108) SEQ ID NOs.: 217 and 259;~~

~~(109) SEQ ID NOs.: 218 and 259;~~

~~(110) SEQ ID NOs.: 182 and 260;~~

~~(111) SEQ ID NOs.: 182 and 261;~~

~~(112) SEQ ID NOs.: 182 and 262;~~

~~(113) SEQ ID NOs.: 182 and 263;~~

~~(114) SEQ ID NOs.: 182 and 264;~~

~~(115) SEQ ID NOs.: 182 and 265;~~

~~(116) SEQ ID NOs.: 182 and 266;~~

~~(117) SEQ ID NOs.: 182 and 267;~~

~~(118) SEQ ID NOs.: 182 and 268;~~

~~(119) SEQ ID NOs.: 182 and 269;~~

~~(120) SEQ ID NOs.: 182 and 270;~~

~~(121) SEQ ID NOs.: 182 and 271;~~

~~(122) SEQ ID NOs.: 182 and 272;~~

~~(123) SEQ ID NOs.: 219 and 273;~~

~~(124) SEQ ID NOs.: 191 and 274;~~

~~(125) SEQ ID NOs.: 182 and 275;~~

~~(126) SEQ ID NOs.: 220 and 277;~~

~~(127) SEQ ID NOs.: 182 and 278;~~

~~(128) SEQ ID NOs.: 182 and 279;~~

~~(129) SEQ ID NOs.: 182 and 280;~~

~~(130) SEQ ID NOs.: 182 and 281;~~

~~(131) SEQ ID NOs.: 182 and 282;~~

~~(132) SEQ ID NOs.: 221 and 228;~~

~~(133) SEQ ID NOs.: 221 and 283;~~

~~(134) SEQ ID NOs.: 182 and 284;~~

~~(135) SEQ ID NOs.: 221 and 285;~~

~~(136) SEQ ID NOs.: 182 and 286;~~

~~(137) SEQ ID NOs.: 221 and 287;~~

~~(138) SEQ ID NOs.: 221 and 288;~~

~~(139) SEQ ID NOs.: 221 and 289;~~

~~(140) SEQ ID NOs.: 182 and 290;~~

~~(141) SEQ ID NOs.: 221 and 291;~~

~~(142) SEQ ID NOs.: 182 and 292;~~

~~(143) SEQ ID NOs.: 221 and 293;~~

~~(144) SEQ ID NOs.: 221 and 294;~~

~~(145) SEQ ID NOs.: 221 and 295;~~

~~(146) SEQ ID NOs.: 182 and 296;~~

~~(147) SEQ ID NOs.: 221 and 297;~~

~~(148) SEQ ID NOs.: 182 and 298;~~

~~(149) SEQ ID NOs.: 221 and 299;~~

~~(150) SEQ ID NOs.: 221 and 300;~~

~~(151) SEQ ID NOs.: 221 and 301;~~

~~(152) SEQ ID NOs.: 182 and 302;~~

~~(153) SEQ ID NOs.: 221 and 303;~~

~~(154) SEQ ID NOs.: 182 and 304;~~

~~(155) SEQ ID NOs.: 221 and 305;~~

~~(156) SEQ ID NOs.: 182 and 306;~~

~~(157) SEQ ID NOs.: 182 and 307;~~

~~(158) SEQ ID NOs.: 182 and 308;~~

~~(159) SEQ ID NOs.: 182 and 309;~~

~~(160) SEQ ID NOs.: 220 and 310;~~

~~(161) SEQ ID NOs.: 220 and 311;~~

~~(162) SEQ ID NOs.: 182 and 228;~~

~~(163) SEQ ID NOs.: 465 and 276;~~

~~(164) SEQ ID NOs.: 466 and 276;~~

~~(165) SEQ ID NOs.: 182 and 479;~~

~~(166) SEQ ID NOs.: 465 and 479;~~

~~(167) SEQ ID NOs.: 466 and 479;~~

~~(168) SEQ ID NOs.: 182 and 480;~~

~~(169) SEQ ID NOs.: 465 and 480;~~

~~(170) SEQ ID NOs.: 466 and 480;~~

~~(171) SEQ ID NOs.: 182 and 481;~~

~~(172) SEQ ID NOs.: 182 and 482;~~

~~(173) SEQ ID NOs.: 465 and 482;~~

~~(174) SEQ ID NOs.: 466 and 482;~~

~~(175) SEQ ID NOs.: 182 and 483;~~

~~(176) SEQ ID NOs.: 182 and 484;~~

~~(177) SEQ ID NOs.: 465 and 484;~~

~~(178) SEQ ID NOs.: 466 and 484;~~

~~(179) SEQ ID NOs.: 182 and 485;~~

~~(180) SEQ ID NOs.: 182 and 486;~~

~~(181) SEQ ID NOs.: 465 and 486;~~

~~(182) SEQ ID NOs.: 466 and 486;~~

~~(183) SEQ ID NOs.: 182 and 487;~~

~~(184) SEQ ID NOs.: 182 and 488;~~

~~(185) SEQ ID NOs.: 465 and 488;~~

~~(186) SEQ ID NOs.: 466 and 488;~~

~~(187) SEQ ID NOs.: 182 and 489;~~

~~(188) SEQ ID NOs.: 465 and 489;~~

~~(189) SEQ ID NOs.: 466 and 489;~~

~~(190) SEQ ID NOs.: 182 and 491;~~

~~(191) SEQ ID NOs.: 465 and 491;~~

~~(192) SEQ ID NOs.: 466 and 491;~~

~~(193) SEQ ID NOs.: 182 and 492;~~

~~(194) SEQ ID NOs.: 465 and 492;~~

~~(195) SEQ ID NOs.: 466 and 492;~~

~~(196) SEQ ID NOs.: 182 and 493;~~

~~(197) SEQ ID NOs.: 182 and 494;~~

~~(198) SEQ ID NOs.: 465 and 494;~~

~~(199) SEQ ID NOs.: 466 and 494;~~

~~(200) SEQ ID NOs.: 182 and 277;~~

~~(201) SEQ ID NOs.: 465 and 277;~~

~~(202) SEQ ID NOs.: 466 and 277;~~

~~(203) SEQ ID NOs.: 182 and 495;~~

~~(204) SEQ ID NOs.: 465 and 495;~~

~~(205) SEQ ID NOs.: 466 and 495;~~

~~(206) SEQ ID NOs.: 182 and 496;~~

~~(207) SEQ ID NOs.: 465 and 496;~~

~~(208) SEQ ID NOs.: 466 and 496;~~

~~(209) SEQ ID NOs.: 182 and 497;~~

~~(210) SEQ ID NOs.: 465 and 497;~~

~~(211) SEQ ID NOs.: 466 and 497;~~

~~(212) SEQ ID NOs.: 182 and 498;~~

~~(213) SEQ ID NOs.: 182 and 499;~~

~~(214) SEQ ID NOs.: 465 and 499;~~

~~(215) SEQ ID NOs.: 466 and 499;~~

~~(216) SEQ ID NOs.: 182 and 500;~~

~~(217) SEQ ID NOs.: 182 and 501;~~

~~(218) SEQ ID NOs.: 465 and 501;~~

~~(219) SEQ ID NOs.: 466 and 501;~~

~~(220) SEQ ID NOs.: 182 and 502;~~

~~(221) SEQ ID NOs.: 182 and 503;~~

~~(222) SEQ ID NOs.: 182 and 504;~~

~~(223) SEQ ID NOs.: 182 and 505;~~

~~(224) SEQ ID NOs.: 182 and 506;~~

~~(225) SEQ ID NOs.: 182 and 507;~~

~~(226) SEQ ID NOs.: 182 and 508;~~

~~(227) SEQ ID NOs.: 182 and 509;~~

~~(228) SEQ ID NOs.: 182 and 510;~~

~~(229) SEQ ID NOs.: 182 and 511;~~

~~(230) SEQ ID NOs.: 182 and 512;~~

~~(231) SEQ ID NOs.: 182 and 513;~~

~~(232) SEQ ID NOs.: 182 and 514;~~

~~(233) SEQ ID NOs.: 182 and 515;~~

~~(234) SEQ ID NOs.: 467 and 223;~~

~~(235) SEQ ID NOs.: 468 and 223;~~

~~(236) SEQ ID NOs.: 469 and 223;~~

~~(237) SEQ ID NOs.: 470 and 223;~~

~~(238) SEQ ID NOs.: 471 and 223;~~

~~(239) SEQ ID NOs.: 472 and 223;~~

~~(240) SEQ ID NOs.: 473 and 223;~~

~~(241) SEQ ID NOs.: 474 and 223;~~

~~(242) SEQ ID NOs.: 475 and 223;~~

~~(243) SEQ ID NOs.: 476 and 223;~~

~~(244) SEQ ID NOs.: 182 and 516;~~

~~(245) SEQ ID NOs.: 182 and 276;~~

~~(246) SEQ ID NOs.: 182 and 569;~~

(~~247~~i) SEQ ID NOs.: 477 and 223;

(~~248~~ii) SEQ ID NOs.: 477 and 278;

(~~249~~iii) SEQ ID NOs.: 477 and 292; or

(~~250~~iv) SEQ ID NOs.: 478 and 276.

~~27. The antibody or antigen-binding fragment of claim 26, wherein the VH and VL comprise the amino acid sequence set forth in SEQ ID NOs.: 182 and 275, respectively.~~

~~28. The antibody or antigen-binding fragment of claim 26, wherein the VH and VL comprise the amino acid sequence set forth in SEQ ID NOs.: 182 and 278, respectively.~~

~~29. The antibody or antigen-binding fragment of claim 26, wherein the VH and VL comprise the amino acid sequence set forth in SEQ ID NOs.: 182 and 223, respectively.~~

~~30. The antibody or antigen-binding fragment of claim 26, wherein the VH and VL comprise the amino acid sequence set forth in SEQ ID NOs.: 182 and 292, respectively.~~

~~31. The antibody or antigen-binding fragment of claim 26, wherein the VH and VL comprise the amino acid sequence set forth in SEQ ID NOs.: 465 and 276, respectively.~~

~~32. The antibody or antigen-binding fragment of claim 26, wherein the VH and VL comprise the amino acid sequence set forth in SEQ ID NOs.: 466 and 276, respectively.~~

~~33. The antibody or antigen-binding fragment of claim 26, wherein the VH and VL comprise the amino acid sequence set forth in SEQ ID NOs.: 182 and 491, respectively.~~

~~34. The antibody or antigen-binding fragment of claim 26, wherein the VH and VL comprise the amino acid sequence set forth in SEQ ID NOs.: 465 and 491, respectively.~~

~~35. The antibody or antigen-binding fragment of claim 26, wherein the VH and VL comprise the amino acid sequence set forth in SEQ ID NOs.: 466 and 491, respectively.~~

~~36. The antibody or antigen-binding fragment of claim 26, wherein the VH and VL comprise the amino acid sequence set forth in SEQ ID NOs.: 182 and 493, respectively.~~

~~37. The antibody or antigen-binding fragment of claim 26, wherein the VH and VL comprise the amino acid sequence set forth in SEQ ID NOs.: 220 and 276, respectively.~~

~~38. The antibody or antigen-binding fragment of claim 26, wherein the VH and VL comprise the amino acid sequence set forth in SEQ ID NOs.: 182 and 516, respectively.~~

~~39~~19. The antibody or antigen-binding fragment of claim ~~26~~18, wherein the VH and VL comprise the amino acid sequence set forth in SEQ ID NOs.: 477 and 278, respectively.

~~40. The antibody or antigen-binding fragment of claim 26, wherein the VH and VL comprise the amino acid sequence set forth in SEQ ID NOs.: 478 and 276, respectively.~~

~~41~~20. The antibody or antigen-binding fragment thereof of any one of claims 1 to ~~40~~19, comprising a VH that is at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100%, identical to an amino acid sequence selected from the group consisting of SEQ ID NOs: ~~181-221 and 4~~65-478 and a VL that is at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100%, identical to an amino acid sequence selected from the group consisting of SEQ ID NOs: 222-311, 479-516 and 569.

~~42~~21. The antibody or antigen-binding fragment thereof of any one of claims ~~26~~ 18 to ~~41~~20, comprising a human IgG1 Fc region.

~~43~~22. The antibody or antigen-binding fragment thereof of claim ~~42~~21, wherein the human IgG1 Fc region is IgG1m17 (SEQ ID NO:348).

~~44~~23. The antibody or antigen-binding fragment thereof of any one of claims ~~26~~ 18 to ~~43~~22, comprising a human IgG1 Fc region comprising (position numbered according to EU numbering):

(i) aspartic acid at position 239, glutamic acid at position 332, alanine at position 236, leucine at position 330;

(ii) aspartic acid at position 239, glutamic acid at position 332, leucine at position 428, and serine at position 434;

(iii) aspartic acid at position 239, glutamic acid at position 332, alanine at position 236, leucine at position 428, and serine at position 434;

(iv) aspartic acid at position 239, glutamic acid at position 332, leucine at position 330, leucine at position 428, and serine at position 434;

(v) aspartic acid at position 239, glutamic acid at position 332, alanine at position 236, leucine at position 330, leucine at position 428, and serine at position 434; or

(vi) leucine at position 243, proline at position 292, leucine at position 300, isoleucine at position 305, leucine at position 396, leucine at position 428, and serine at position 434.

~~45~~24. The antibody or antigen-binding fragment thereof of any one of claims ~~26~~ 18 to ~~44~~23, wherein the antibody comprises a human kappa light chain constant region.

~~46~~25. The antibody or antigen-binding fragment thereof of claim ~~45~~24, wherein the human kappa light chain constant region is Km3 (SEQ ID NO:351).

~~47. The antibody or antigen-binding fragment thereof of any one of claims 26 to 46, wherein the antibody or antigen-binding fragment has greater killing potency of HIV-infected cells than Antibody A and/or Antibody B.~~

~~48. The antibody or antigen-binding fragment thereof of any one of claims 26 to 47, wherein the antibody or antigen-binding fragment has an improved, extended, enhanced or increased serum half-life in a human than Antibody A and/or Antibody B.~~

~~49~~26. The antibody or antigen-binding fragment thereof of any one of claims ~~26~~ 18 to ~~48~~25, wherein the antibody or antigen-binding fragment has a serum half-life in a human of at least about 3 days~~, *e.g.*, at least about 4 days, at least about 5 days, at least about 6 days, at least about 7 days, at least about 8 days, at least about 9 days, at least about 10 days, at least about 12 days, at least about 14 days, at least about 16 days, at least about 18 days, at least about 20 days, at least about 21 days, at least about 24 days, at least about 28 days, at least about 30 days, or longer~~.

~~50~~27. An antigen-binding fragment of any one of claims 1 to ~~49~~26, comprising a scFv, $sc(Fv)_2$, Fab, $F(ab)_2$, Fab', $F(ab')_2$, Facb or Fv fragment.

~~51~~28. ~~An~~ The antibody of claim 1, the antibody comprising a heavy chain and a light chain, wherein the heavy chain and the light chain comprise the amino acid sequences set forth, respectively, below:

~~(1) SEQ ID NOs.: 2 and 49;~~
~~(2) SEQ ID NOs.: 5 and 49;~~
~~(3) SEQ ID NOs.: 6 and 49;~~
~~(4) SEQ ID NOs.: 2 and 50;~~
~~(5) SEQ ID NOs.: 6 and 50;~~
~~(6) SEQ ID NOs.: 7 and 49;~~
~~(7) SEQ ID NOs.: 8 and 49;~~
~~(8) SEQ ID NOs.: 9 and 49;~~
~~(9) SEQ ID NOs.: 10 and 49;~~
~~(10) SEQ ID NOs.: 11 and 49;~~
~~(11) SEQ ID NOs.: 12 and 49;~~

~~(12) SEQ ID NOs.: 13 and 49;~~

~~(13) SEQ ID NOs.: 14 and 49;~~

~~(14) SEQ ID NOs.: 15 and 49;~~

~~(15) SEQ ID NOs.: 16 and 49;~~

~~(16) SEQ ID NOs.: 17 and 49;~~

~~(17) SEQ ID NOs.: 18 and 49;~~

~~(18) SEQ ID NOs.: 19 and 49;~~

~~(19) SEQ ID NOs.: 20 and 49;~~

~~(20) SEQ ID NOs.: 21 and 49;~~

~~(21) SEQ ID NOs.: 22 and 49;~~

~~(22) SEQ ID NOs.: 23 and 49;~~

~~(23) SEQ ID NOs.: 24 and 49;~~

~~(24) SEQ ID NOs.: 25 and 49;~~

~~(25) SEQ ID NOs.: 26 and 49;~~

~~(26) SEQ ID NOs.: 27 and 49;~~

~~(27) SEQ ID NOs.: 28 and 49;~~

~~(28) SEQ ID NOs.: 29 and 49;~~

~~(29) SEQ ID NOs.: 30 and 49;~~

~~(30) SEQ ID NOs.: 2 and 51;~~

~~(31) SEQ ID NOs.: 2 and 52;~~

~~(32) SEQ ID NOs.: 2 and 53;~~

~~(33) SEQ ID NOs.: 2 and 54;~~

~~(34) SEQ ID NOs.: 2 and 55;~~

~~(35) SEQ ID NOs.: 2 and 56;~~

~~(36) SEQ ID NOs.: 2 and 57;~~

~~(37) SEQ ID NOs.: 2 and 58;~~

~~(38) SEQ ID NOs.: 2 and 59;~~

~~(39) SEQ ID NOs.: 2 and 60;~~

~~(40) SEQ ID NOs.: 2 and 61;~~

~~(41) SEQ ID NOs.: 2 and 62;~~

~~(42) SEQ ID NOs.: 2 and 63;~~

~~(43) SEQ ID NOs.: 2 and 64;~~

~~(44) SEQ ID NOs.: 2 and 65;~~

~~(45) SEQ ID NOs.: 2 and 66;~~

~~(46) SEQ ID NOs.: 2 and 67;~~

~~(47) SEQ ID NOs.: 2 and 68;~~

~~(48) SEQ ID NOs.: 2 and 69;~~

~~(49) SEQ ID NOs.: 2 and 70;~~

~~(50) SEQ ID NOs.: 2 and 71;~~

~~(51) SEQ ID NOs.: 2 and 72;~~

~~(52) SEQ ID NOs.: 2 and 73;~~

~~(53) SEQ ID NOs.: 2 and 74;~~

~~(54) SEQ ID NOs.: 2 and 75;~~

~~(55) SEQ ID NOs.: 2 and 76;~~

~~(56) SEQ ID NOs.: 2 and 77;~~

~~(57) SEQ ID NOs.: 2 and 78;~~

~~(58) SEQ ID NOs.: 31 and 63;~~

~~(59) SEQ ID NOs.: 32 and 63;~~

~~(60) SEQ ID NOs.: 33 and 63;~~

~~(61) SEQ ID NOs.: 31 and 65;~~

~~(62) SEQ ID NOs.: 32 and 65;~~

~~(63) SEQ ID NOs.: 33 and 65;~~

~~(64) SEQ ID NOs.: 34 and 49;~~

~~(65) SEQ ID NOs.: 35 and 49;~~

~~(66) SEQ ID NOs.: 36 and 49;~~

~~(67) SEQ ID NOs.: 37 and 49;~~

~~(68) SEQ ID NOs.: 38 and 49;~~

~~(69) SEQ ID NOs.: 39 and 49;~~

~~(70) SEQ ID NOs.: 2 and 79;~~

~~(71) SEQ ID NOs.: 34 and 79;~~

~~(72) SEQ ID NOs.: 35 and 79;~~

~~(73) SEQ ID NOs.: 36 and 79;~~

~~(74) SEQ ID NOs.: 37 and 79;~~

~~(75) SEQ ID NOs.: 38 and 79;~~

~~(76) SEQ ID NOs.: 39 and 79;~~

~~(77) SEQ ID NOs.: 2 and 80;~~

~~(78) SEQ ID NOs.: 34 and 80;~~

~~(79) SEQ ID NOs.: 35 and 80;~~

~~(80) SEQ ID NOs.: 36 and 80;~~

~~(81) SEQ ID NOs.: 37 and 80;~~

~~(82) SEQ ID NOs.: 38 and 80;~~

~~(83) SEQ ID NOs.: 39 and 80;~~

~~(84) SEQ ID NOs.: 2 and 81;~~

~~(85) SEQ ID NOs.: 34 and 81;~~

~~(86) SEQ ID NOs.: 35 and 81;~~

~~(87) SEQ ID NOs.: 36 and 81;~~

~~(88) SEQ ID NOs.: 37 and 81;~~

~~(89) SEQ ID NOs.: 38 and 81;~~

~~(90) SEQ ID NOs.: 39 and 81;~~

~~(91) SEQ ID NOs.: 2 and 82;~~

~~(92) SEQ ID NOs.: 34 and 82;~~

~~(93) SEQ ID NOs.: 35 and 82;~~

~~(94) SEQ ID NOs.: 36 and 82;~~

~~(95) SEQ ID NOs.: 37 and 82;~~

~~(96) SEQ ID NOs.: 38 and 82;~~

~~(97) SEQ ID NOs.: 39 and 82;~~

~~(98) SEQ ID NOs.: 2 and 83;~~

~~(99) SEQ ID NOs.: 34 and 83;~~

~~(100) SEQ ID NOs.: 35 and 83;~~

~~(101) SEQ ID NOs.: 36 and 83;~~

~~(102) SEQ ID NOs.: 37 and 83;~~

~~(103) SEQ ID NOs.: 38 and 83;~~

~~(104) SEQ ID NOs.: 39 and 83;~~

~~(105) SEQ ID NOs.: 2 and 84;~~

~~(106) SEQ ID NOs.: 34 and 84;~~

~~(107) SEQ ID NOs.: 35 and 84;~~

~~(108) SEQ ID NOs.: 36 and 84;~~

~~(109) SEQ ID NOs.: 37 and 84;~~

~~(110) SEQ ID NOs.: 38 and 84~~

~~(111) SEQ ID NOs.: 39 and 84;~~

~~(112) SEQ ID NOs.: 2 and 85;~~

~~(113) SEQ ID NOs.: 2 and 86;~~

~~(114) SEQ ID NOs.: 2 and 87;~~

~~(115) SEQ ID NOs.: 2 and 88;~~

~~(116) SEQ ID NOs.: 2 and 89;~~

~~(117) SEQ ID NOs.: 2 and 90;~~

~~(118) SEQ ID NOs.: 2 and 91;~~

~~(119) SEQ ID NOs.: 2 and 92;~~

~~(120) SEQ ID NOs.: 2 and 93;~~

~~(121) SEQ ID NOs.: 2 and 94;~~

~~(122) SEQ ID NOs.: 2 and 95;~~

~~(123) SEQ ID NOs.: 2 and 96;~~

~~(124) SEQ ID NOs.: 2 and 97;~~

~~(125) SEQ ID NOs.: 40 and 98;~~

~~(126) SEQ ID NOs.: 12 and 99;~~

~~(127) SEQ ID NOs.: 2 and 100;~~

~~(128) SEQ ID NOs.: 41 and 49;~~

~~(129) SEQ ID NOs.: 42 and 101;~~

~~(130) SEQ ID NOs.: 42 and 102;~~

~~(131) SEQ ID NOs.: 2 and 103;~~

~~(132) SEQ ID NOs.: 2 and 104;~~

~~(133) SEQ ID NOs.: 2 and 105;~~

~~(134) SEQ ID NOs.: 2 and 106;~~

~~(135) SEQ ID NOs.: 2 and 107;~~

~~(136) SEQ ID NOs.: 43 and 49;~~

~~(137) SEQ ID NOs.: 44 and 49;~~

~~(138) SEQ ID NOs.: 45 and 49;~~

~~(139) SEQ ID NOs.: 46 and 49;~~

~~(140) SEQ ID NOs.: 47 and 53;~~

~~(141) SEQ ID NOs.: 47 and 108;~~

~~(142) SEQ ID NOs.: 2 and 109;~~

~~(143) SEQ ID NOs.: 47 and 110;~~

~~(144) SEQ ID NOs.: 2 and 111;~~

~~(145) SEQ ID NOs.: 47 and 112;~~

~~(146) SEQ ID NOs.: 47 and 113;~~

~~(147) SEQ ID NOs.: 47 and 114;~~

~~(148) SEQ ID NOs.: 2 and 115;~~

~~(149) SEQ ID NOs.: 47 and 116;~~

~~(150) SEQ ID NOs.: 2 and 117;~~

~~(151) SEQ ID NOs.: 47 and 118;~~

~~(152) SEQ ID NOs.: 47 and 119;~~

~~(153) SEQ ID NOs.: 47 and 120;~~

~~(154) SEQ ID NOs.: 2 and 121;~~

~~(155) SEQ ID NOs.: 47 and 122;~~

~~(156) SEQ ID NOs.: 2 and 123;~~

~~(157) SEQ ID NOs.: 47 and 124;~~

~~(158) SEQ ID NOs.: 47 and 125;~~

~~(159) SEQ ID NOs.: 47 and 126;~~

~~(160) SEQ ID NOs.: 2 and 127;~~

~~(161) SEQ ID NOs.: 47 and 128;~~

~~(162) SEQ ID NOs.: 2 and 129;~~

~~(163) SEQ ID NOs.: 47 and 130;~~

~~(164) SEQ ID NOs.: 2 and 131;~~

~~(165) SEQ ID NOs.: 2 and 132;~~

~~(166) SEQ ID NOs.: 2 and 133;~~

~~(167) SEQ ID NOs.: 2 and 134;~~

~~(168) SEQ ID NOs.: 42 and 135;~~

~~(169) SEQ ID NOs.: 42 and 136;~~

~~(170) SEQ ID NOs.: 517 and 101;~~

~~(171) SEQ ID NOs.: 518 and 101;~~

~~(172) SEQ ID NOs.: 2 and 531;~~

~~(173) SEQ ID NOs.: 517 and 531;~~

~~(174) SEQ ID NOs.: 518 and 531;~~

~~(175) SEQ ID NOs.: 2 and 532;~~

~~(176) SEQ ID NOs.: 517 and 532;~~

~~(177) SEQ ID NOs.: 518 and 532;~~

~~(178) SEQ ID NOs.: 2 and 533;~~

~~(179) SEQ ID NOs.: 2 and 534;~~

~~(180) SEQ ID NOs.: 517 and 534;~~

~~(181) SEQ ID NOs.: 518 and 534;~~

~~(182) SEQ ID NOs.: 2 and 535;~~

~~(183) SEQ ID NOs.: 2 and 536;~~

~~(184) SEQ ID NOs.: 517 and 536;~~

~~(185) SEQ ID NOs.: 518 and 536;~~

~~(186) SEQ ID NOs.: 2 and 537;~~

~~(187) SEQ ID NOs.: 2 and 538;~~

~~(188) SEQ ID NOs.: 517 and 538;~~

~~(189) SEQ ID NOs.: 518 and 538;~~

~~(190) SEQ ID NOs.: 2 and 539;~~

~~(191) SEQ ID NOs.: 2 and 540;~~

~~(192) SEQ ID NOs.: 517 and 540;~~

~~(193) SEQ ID NOs.: 518 and 540;~~

~~(194) SEQ ID NOs.: 2 and 541;~~

~~(195) SEQ ID NOs.: 517 and 541;~~

~~(196) SEQ ID NOs.: 518 and 541;~~

~~(197) SEQ ID NOs.: 2 and 542;~~

~~(198) SEQ ID NOs.: 517 and 542;~~

~~(199) SEQ ID NOs.: 518 and 542;~~

~~(200) SEQ ID NOs.: 2 and 543;~~

~~(201) SEQ ID NOs.: 517 and 543;~~

~~(202) SEQ ID NOs.: 518 and 543;~~

~~(203) SEQ ID NOs.: 2 and 544;~~

~~(204) SEQ ID NOs.: 2 and 545;~~

~~(205) SEQ ID NOs.: 517 and 545;~~

~~(206) SEQ ID NOs.: 518 and 545;~~

~~(207) SEQ ID NOs.: 2 and 102;~~

~~(208) SEQ ID NOs.: 517 and 102;~~

~~(209) SEQ ID NOs.: 518 and 102;~~

~~(210) SEQ ID NOs.: 2 and 546;~~

~~(211) SEQ ID NOs.: 517 and 546;~~

~~(212) SEQ ID NOs.: 518 and 546;~~

~~(213) SEQ ID NOs.: 2 and 547;~~

~~(214) SEQ ID NOs.: 517 and 547;~~

~~(215) SEQ ID NOs.: 518 and 547;~~

~~(216) SEQ ID NOs.: 2 and 548;~~

~~(217) SEQ ID NOs.: 517 and 548;~~

~~(218) SEQ ID NOs.: 518 and 548;~~

~~(219) SEQ ID NOs.: 2 and 549;~~

~~(220) SEQ ID NOs.: 2 and 550;~~

~~(221) SEQ ID NOs.: 517 and 550;~~

~~(222) SEQ ID NOs.: 518 and 550;~~

~~(223) SEQ ID NOs.: 2 and 551;~~

~~(224) SEQ ID NOs.: 2 and 552;~~

~~(225) SEQ ID NOs.: 517 and 552;~~

~~(226) SEQ ID NOs.: 518 and 552;~~

~~(227) SEQ ID NOs.: 2 and 553;~~

~~(228) SEQ ID NOs.: 2 and 554;~~

~~(229) SEQ ID NOs.: 2 and 555;~~

~~(230) SEQ ID NOs.: 2 and 556;~~

~~(231) SEQ ID NOs.: 2 and 557;~~

~~(232) SEQ ID NOs.: 2 and 558;~~

~~(233) SEQ ID NOs.: 2 and 559;~~

~~(234) SEQ ID NOs.: 2 and 560;~~

~~(235) SEQ ID NOs.: 2 and 561;~~

~~(236) SEQ ID NOs.: 2 and 562;~~

~~(237) SEQ ID NOs.: 2 and 563;~~

~~(238) SEQ ID NOs.: 2 and 564;~~

~~(239) SEQ ID NOs.: 2 and 565;~~

~~(240) SEQ ID NOs.: 2 and 566;~~

~~(241) SEQ ID NOs.: 519 and 49;~~

~~(242) SEQ ID NOs.: 520 and 49;~~

~~(243) SEQ ID NOs.: 521 and 49;~~

~~(244) SEQ ID NOs.: 522 and 49;~~

~~(245) SEQ ID NOs.: 523 and 49;~~

~~(246) SEQ ID NOs.: 524 and 49;~~

~~(247) SEQ ID NOs.: 526 and 49;~~

~~(248) SEQ ID NOs.: 527 and 49;~~

~~(249) SEQ ID NOs.: 528 and 49;~~

~~(250) SEQ ID NOs.: 2 and 567;~~

~~(251) SEQ ID NOs.: 2 and 568;~~

~~(252) SEQ ID NOs.: 2 and 101;~~

(~~253~~i) SEQ ID NOs.: 529 and 49;

(~~254~~ii) SEQ ID NOs.: 529 and 103;

(~~255~~iii) SEQ ID NOs.: 529 and 117; or

(~~256~~iv) SEQ ID NOs.: 530 and 101.

~~52. The antibody of claim 51, wherein the heavy chain and light have the amino acid sequence set forth in SEQ ID NOs.: 2 and 49, respectively.~~

~~53. The antibody of claim 51, wherein the heavy chain and light have the amino acid sequence set forth in SEQ ID NOs.: 2 and 100, respectively.~~

~~54. The antibody of claim 51, wherein the heavy chain and light have the amino acid sequence set forth in SEQ ID NOs.: 42 and 101, respectively.~~

~~55. The antibody of claim 51, wherein the heavy chain and light have the amino acid sequence set forth in SEQ ID NOs.: 2 and 103, respectively.~~

~~56. The antibody of claim 51, wherein the heavy chain and light have the amino acid sequence set forth in SEQ ID NOs.: 2 and 117, respectively.~~

~~57. The antibody of claim 51, wherein the heavy chain and light have the amino acid sequence set forth in SEQ ID NOs.: 517 and 101, respectively.~~

~~58. The antibody of claim 51, wherein the heavy chain and light have the amino acid sequence set forth in SEQ ID NOs.: 518 and 101, respectively.~~

~~59. The antibody of claim 51, wherein the heavy chain and light have the amino acid sequence set forth in SEQ ID NOs.: 2 and 542, respectively.~~

~~60. The antibody of claim 51, wherein the heavy chain and light have the amino acid sequence set forth in SEQ ID NOs.: 517 and 542, respectively.~~

~~61. The antibody of claim 51, wherein the heavy chain and light have the amino acid sequence set forth in SEQ ID NOs.: 518 and 542, respectively.~~

~~62. The antibody of claim 51, wherein the heavy chain and light have the amino acid sequence set forth in SEQ ID NOs.: 2 and 544, respectively.~~

~~63. The antibody of claim 51, wherein the heavy chain and light have the amino acid sequence set forth in SEQ ID NOs.: 2 and 567, respectively.~~

~~64~~29. The antibody of claim ~~51~~28, wherein the heavy chain and light have the amino acid sequence set forth in SEQ ID NOs.: 529 and 103, respectively.

~~65. The antibody of claim 51, wherein the heavy chain and light have the amino acid sequence set forth in SEQ ID NOs.: 530 and 101, respectively.~~

~~66~~30. The antibody or antigen-binding fragment thereof of any one of claims 1 to ~~65~~297, comprising a heavy chain (HC) that is at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100%, identical to an amino acid sequence selected from the group consisting of SEQ ID NOs: ~~1-47 and 517~~529-530 and a light chain (LC) that is at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100%, identical to an amino acid sequence selected from the group consisting of SEQ ID NOs: 48-136 and 531-567.

~~67~~31. The antibody or antigen-binding fragment thereof of any one of claims 1 to ~~66~~30, wherein at least 50%, at least 60%, at least 70%, least 80%, at least 85%, at least 90%, or more, N-linked glycosylation sites in the VL are sialylated.

~~68. An antibody or an antigen-binding fragment thereof that binds to human immunodeficiency virus-1 (HIV-1) Envelope glycoprotein gp120, the antibody or antigen-binding fragment thereof comprising (i) a heavy chain variable region (VH) comprising VH complementary determining regions 1-3 (CDRs 1-3) and (ii) a light chain variable region (VL) comprising VL CDRs 1-3, wherein the VH CDRs 1-3 and VL CDRs 1-3 have the sequences set forth in:~~

~~(i) SEQ ID NOs.: 159, 138, 139, 140, 141, and 142, respectively;~~
~~(ii) SEQ ID NOs.: 137, 160, 139, 140, 141, and 142, respectively;~~
~~(iii) SEQ ID NOs.: 137, 161, 139, 140, 141, and 142, respectively;~~
~~(iv) SEQ ID NOs.: 137, 162, 139, 140, 141, and 142, respectively;~~
~~(v) SEQ ID NOs.: 137, 163, 139, 140, 141, and 142, respectively;~~
~~(vi) SEQ ID NOs.: 137, 138, 164, 140, 141, and 142, respectively;~~

~~(vii) SEQ ID NOs.: 159, 138, 164, 140, 141, and 142, respectively;~~

~~(viii) SEQ ID NOs.: 137, 138, 139, 140, 165, and 142, respectively;~~

~~(ix) SEQ ID NOs.: 137, 138, 139, 140, 166, and 142, respectively;~~

~~(x) SEQ ID NOs.: 137, 138, 139, 140, 167, and 142, respectively;~~

~~(xi) SEQ ID NOs.: 137, 138, 139, 140, 168, and 142, respectively;~~

~~(xii) SEQ ID NOs.: 137, 138, 154, 140, 141, and 142, respectively, or~~

~~(xiii) SEQ ID NOs.: 137, 138, 139, 140, 141, and 142, respectively, and wherein at least 50%, at least 60%, at least 70%, least 80%, at least 85%, at least 90%, or more, N-linked glycosylation sites in the VL are sialylated.~~

~~69~~32. The antibody or antigen-binding fragment of ~~any one of~~ claim~~s 67 to 68~~1, wherein the asparagine at VL amino acid position 72 according to Kabat numbering (N72) is sialylated.

~~70~~33. The antibody or antigen-binding fragment of ~~any one of~~ claim~~s 67 to 69~~31 or 32, wherein the sialylated N-linked glycosylation sites in the VL comprise from 1 to 5 sialic acid residues~~, *e.g.*, from 1 to 4 sialic acid residues, *e.g.*, from 1 to 3 sialic acid residues, *e.g.*, from 1 to 2 sialic acid residues~~.

~~71~~34. The antibody or antigen-binding fragment thereof of any one of claims ~~67~~ 31 to ~~70~~33, wherein the VL are sialylated with N-acetylneuraminic acid (NANA).

~~72~~35. The antibody or antigen-binding fragment thereof of any one of claims ~~67~~ 31 to ~~71~~34, wherein the sialic acid residues are present in biantennary structures.

~~73~~36. The antibody or antigen-binding fragment thereof of any one of claims ~~67~~ 31 to ~~72~~35, wherein the sialic acid residues are present in complex N-linked glycan structures.

~~74~~37. The antibody or antigen-binding fragment thereof of any one of claims ~~67~~ 31 to ~~72~~35, wherein the sialic acid residues are present in hybrid N-linked glycan structures.

~~75~~38. The antibody or antigen-binding fragment thereof of any one of claims ~~67~~ 31 to ~~74~~37, wherein the glycans are terminally sialylated.

~~76~~39. A bispecific antibody comprising:

a first antigen binding arm that binds to gp120, the first antigen binding arm comprising:

~~i. the VH CDRs 1-3 and the VL CDRs 1-3; or~~

~~ii.~~ the VH and the VL of ~~any one or~~ claim~~s 1 to 75~~18; and

a second antigen binding arm binding to a second antigen.

~~77. The bi-specific antibody of claim 76, wherein the second antigen is selected from the group consisting of CD3, FcγRI (CD64), FcγRII (CD32), FcγRIII (CD16); CD89, CCR5, CD4, gp41, killer cell immunoglobulin like receptor, three Ig domains and long cytoplasmic tail 1 (KIR3DL1), killer cell immunoglobulin like receptor, three Ig domains and long cytoplasmic tail 1 (KIR3DL1), killer cell immunoglobulin like receptor, two Ig domains and long cytoplasmic tail 1 (KIR2DL1), killer cell immunoglobulin like receptor, two Ig domains and long cytoplasmic tail 2 (KIR2DL2), killer cell immunoglobulin like receptor, two Ig domains and long cytoplasmic tail 3 (KIR2DL3), killer cell lectin like receptor C1 (KLRC1), killer cell lectin like receptor C2 (KLRC2), killer cell lectin like receptor C3 (KLRC3), killer cell lectin like receptor C4 (KLRC4), killer cell lectin like receptor D1 (KLRD1), killer cell lectin like receptor K1 (KLRK1), natural cytotoxicity triggering receptor 3 (NCR3 or NKp30), natural cytotoxicity triggering receptor 2 (NCR2 or NK-p44), natural cytotoxicity triggering receptor 1 (NCR1 or NK-p46), CD226 (DNAM-1), cytotoxic and regulatory T cell molecule (CRTAM or CD355), signaling lymphocytic activation molecule family member 1 (SLAMF1), CD48 (SLAMF2), lymphocyte antigen 9 (LY9 or SLAMF3), CD244 (2B4 or SLAMF4), CD84 (SLAMF5), SLAM family member 6 (SLAMF6 or NTB-A), SLAM family member 7 (SLAMF7 or CRACC), CD27 (TNFRSF7), semaphorin 4D (SEMA4D or CD100), and CD160 (NK1), and a second epitope of gp120.~~

~~78~~40. A pharmaceutical composition comprising the antibody or antigen-binding fragment of any one of claims 1-~~77~~39, and a pharmaceutically acceptable carrier.

~~79~~41. The pharmaceutical composition of claim ~~78~~40, further comprising a second agent for treating an HIV infection.

~~80. The pharmaceutical composition of any one of claims 78 to 79, further comprising a toll-like receptor (TLR) agonist.~~

~~81. The pharmaceutical composition of any one of claims 78 to 80, wherein the TLR agonist is a TLR2 agonist, a TLR3 agonist, a TLR7 agonist, a TLR8 agonist or a TLR9 agonist~~

~~82. The pharmaceutical composition of any one of claims 78 to 80, further comprising a TLR7 agonist.~~

~~83. The pharmaceutical composition of claim 82, wherein the TLR7 agonist is selected from the group consisting of vesatolimod, imiquimod, and resiquimod.~~

~~84. The pharmaceutical composition of claim 78, further comprising an antibody or antigen-binding fragment thereof that binds, inhibits, and/or neutralizes HIV.~~

~~85~~42. The pharmaceutical composition of ~~any one of~~ claim~~s~~ ~~87 to 84~~41, further comprising a second antibody or antigen-binding fragment thereof that binds, inhibits, and/or neutralizes HIV, wherein the second antibody or antigen-binding fragment thereof does not compete with the antibody or antigen-binding fragment of ~~any one of~~ claim~~s~~ **Error! Reference source not found.** ~~70~~ for binding to gp120.

~~86. The pharmaceutical composition of claim 85, wherein the second antibody or antigen-binding fragment thereof that binds, inhibits, and/or neutralizes HIV, competes with or comprises VH and VL variable domains of a broadly neutralizing antibody (bNAb) against HIV.~~

~~87. The pharmaceutical composition of any one of claims 85 to 86, wherein the second antibody or antigen-binding fragment thereof that binds, inhibits, and/or neutralizes HIV, binds to an epitope or region of gp120 selected from the group consisting of:~~

- ~~i. third variable loop (V3) and/or high-mannose patch comprising a N332 oligomannose glycan;~~
- ~~ii. second variable loop (V2) and/or Env trimer apex;~~
- ~~iii. gp120/gp41 interface; or~~
- ~~iv. silent face of gp120.~~

~~88. The pharmaceutical composition of any one of claims 85 to 87, wherein the second antibody or antigen-binding fragment thereof that binds, inhibits, and/or neutralizes HIV, binds to an epitope or region of gp120 in the third variable loop (V3) and/or high-mannose patch comprising a N332 oligomannose glycan and competes with or comprises VH and VL regions from an antibody selected from the group consisting of GS-9722, PGT-121, PGT-122, PGT-123, PGT-124, PGT-125, PGT-126, PGT-128, PGT-130, PGT-133, PGT-134, PGT-135, PGT-136, PGT-137, PGT-138, PGT-139, 10-1074, VRC24, 2G12, BG18, 354BG8, 354BG18, 354BG42, 354BG33, 354BG129, 354BG188, 354BG411, 354BG426, DH270.1, DH270.6, PGDM12, VRC41.01, PGDM21, PCDN-33A, BF520.1 and VRC29.03.~~

89. The pharmaceutical composition of any one of claims 85 to 87, wherein the second antibody or antigen-binding fragment thereof that binds, inhibits, and/or neutralizes HIV, binds to an epitope or region of gp120 in the second variable loop (V2) and/or Env trimer apex and competes with or comprises VH and VL regions from an antibody selected from the group consisting of PG9, PG16, PGC14, PGG14, PGT-142, PGT-143, PGT-144, PGT-145, CH01, CH59, PGDM1400, CAP256, CAP256-VRC26.08, CAP256-VRC26.09, CAP256-VRC26.25, PCT64-24E and VRC38.01.

90. The pharmaceutical composition of any one of claims 85 to 87, wherein the second antibody or antigen-binding fragment binds to an epitope or region of gp120 in the gp120/gp41 interface and competes with or comprises VH and VL regions from an antibody selected from the group consisting of PGT-151, CAP248-2B, 35O22, 8ANC195, ACS202, VRC34 and VRC34.01.

91. The pharmaceutical composition of any one of claims 85 to 87, wherein the second antibody or antigen-binding fragment thereof that binds, inhibits, and/or neutralizes HIV, binds to an epitope or region of the gp120 silent face and competes with or comprises VH and VL regions from an antibody selected from the group consisting of VRC-PG05 and SF12.

92. The pharmaceutical composition of any one of claims 85 to 86, wherein the second antibody or antigen-binding fragment thereof that binds, inhibits, and/or neutralizes HIV, binds to an epitope or region of gp41 in the membrane proximal region (MPER).

93. The pharmaceutical composition of claim 92, wherein the second antibody or antigen-binding fragment thereof that binds, inhibits, and/or neutralizes HIV, binds to an epitope or region of gp41 in the membrane proximal region (MPER) and competes with or comprises VH and VL regions from an antibody selected from the group consisting of 10E8, 10E8v4, 10E8-5R-100cF, 4E10, DH511.11P, 2F5, 7b2, and LN01.

94. The pharmaceutical composition of any one of claims 85 to 86, wherein the second antibody or antigen-binding fragment thereof that binds, inhibits, and/or neutralizes HIV, binds to an epitope or region of the gp41 fusion peptide and competes with or comprises VH and VL regions from an antibody selected from the group consisting of VRC34 and ACS202.

95. The pharmaceutical composition of claim 84, wherein the second antibody or antigen-binding fragment thereof that binds, inhibits, and/or neutralizes HIV comprises the VH and VL of PGT121.60 or PGT121.66.

96. The pharmaceutical composition of claim 84, wherein the antibody or antigen-binding fragment thereof that binds, inhibits, and/or neutralizes HIV comprises the VH within SEQ ID NO:454 and the VL within SEQ ID NO:455.

97. The pharmaceutical composition of claim 84, wherein the antibody or antigen-binding fragment thereof that binds, inhibits, and/or neutralizes HIV comprises the VH within SEQ ID NO:454 and the VL within SEQ ID NO:456.

98. A nucleic acid or nucleic acids encoding the antibody or antigen-binding fragment of any one of claims 1-77.

99. The nucleic acid or nucleic acids of claim 98, wherein the nucleic acid or nucleic acids comprise DNA, cDNA or mRNA.

100. The nucleic acid or nucleic acids of any one of claims 98 to 99, encoding a VH selected from the group consisting of SEQ ID NOs: 181-221 and 465-478 and having at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100%, identical to a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 572-581; and encoding a VL selected from the group consisting of SEQ ID NOs: 222-311, 479-516 and 569 and having at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100%, identical to a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 582-595.

101. The nucleic acid or nucleic acids of any one of claims 98 to 99, encoding a HC selected from the group consisting of SEQ ID NOs: 1-47 and 517-530 and having at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100%, identical to a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 596-605; and encoding a LC selected from the group consisting of SEQ ID NOs: 48-136 and 531-567 and having at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, at least 99%, or 100%, identical to a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 606-619.

~~102. An expression vector or expression vectors comprising the nucleic acid or nucleic acids of any one of claims 98 to 101 operably linked to a regulatory sequence.~~

~~103. The expression vector or expression vectors of claim 102, wherein the expression vector or expression vectors comprise a plasmid vector or a viral vector.~~

~~104. A pharmaceutical composition comprising the nucleic acid or nucleic acids of any one of claims 98 to 101, or the expression vector or expression vectors of any one of claims 102 to 103, and a pharmaceutically acceptable carrier.~~

~~105. A lipid nanoparticle (LNP) comprising the nucleic acid or nucleic acids of any one of claims 98 to 101, or the expression vector or expression vectors of any one of claims 102 to 103.~~

~~106~~43. A chimeric antigen receptor (CAR) comprising an antigen-binding fragment according to claim ~~50~~27.

~~107~~44. A CAR T-cell comprising the CAR of claim ~~106~~43.

~~108. A host cell or population of cells comprising the nucleic acid or nucleic acids of any one of claims 98 to 101, or the expression vector or expression vectors of any one of claims 102 to 103.~~

~~109. The host cell or population of cells of claim 108, wherein the cell or population of cells comprises a eukaryotic cell.~~

~~110. The cell or population of cells of any one of claims 108 to 109, wherein the cell or population of cells comprises a mammalian cell, an insect cell, a plant cell or a yeast cell.~~

~~111. The cell or population of cells of any one of claims 108 to 110, wherein the mammalian cell is a Chinese Hamster Ovary (CHO) cell.~~

~~112. The cell or population of cells of any one of claims 108 to 110, wherein the mammalian cell is a human cell.~~

~~113. The cell or population of cells of claim 112, wherein the cell is a human embryonic kidney cell or a human B-cell.~~

~~114. The cell or population of cells of any one of claims 108 to 113, wherein the cell predominantly sialylates N-linked glycosylation sites in the variable domains (Fv) of expressed antibodies or antigen binding fragments.~~

~~115. The cell or population of cells of claim 114, wherein at least 50%, at least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, or more, N-linked glycosylation sites in the variable domains (Fv) of expressed antibodies or antigen binding fragments are sialylated.~~

~~116. The cell or population of cells of any one of claims 114 to 115, wherein at least 50%, at least 60%, at least 70%, least 80%, at least 85%, at least 90%, at least 91%, at least 92%, at least 93%, at least 94%, at least 95%, or more, N-linked glycosylation sites in the VL are sialylated.~~

~~117. The cell or population of cells of any one of claims 114 to 116 , wherein the asparagine at VL amino acid position 72 according to Kabat numbering (N72) is sialylated.~~

~~118. The cell or population of cells of any one of claims 114 to 117, wherein the sialylated N-linked glycosylation sites in the VL comprise from 1 to 5 sialic acid residues, *e.g.*, from 1 to 4 sialic acid residues, *e.g.*, from 1 to 3 sialic acid residues, *e.g.*, from 1 to 2 sialic acid residues.~~

~~119. The cell or population of cells of any one of claims 114 to 118, wherein the VL are sialylated with N-acetylneuraminic acid (NANA).~~

~~120. The cell or population of cells of any one of claims 114 to 119, wherein the sialic acid residues are present in biantennary structures.~~

~~121. The cell or population of cells of any one of claims 114 to 120 wherein the sialic acid residues are present in complex N-linked glycan structures.~~

~~122. The cell or population of cells of any one of claims 114 to 121, wherein the sialic acid residues are present in hybrid N-linked glycan structures.~~

~~123. The cell or population of cells of any one of claims 114 to122, wherein the glycans are terminally sialylated.~~

~~124. A method of producing an antibody or antigen-binding fragment thereof, the method comprising:~~

culturing the host cell of any one of claims 108 to 123 in a cell culture; and

isolating the antibody or antigen-binding fragment from the cell culture.

125. The method of claim124, further comprising formulating the antibody or antigen-binding fragment into a sterile pharmaceutical composition suitable for administration to a human subject.

126. A method of treating or preventing HIV in a human subject in need thereof, the method comprising administering to the subject an effective amount of the antibody or antigen-binding fragment thereof of any one of claims 1-77, or the pharmaceutical composition of any one of claims 78-97.

127. The method of claim 126, further comprising administering to the subject a second agent for treating an HIV infection.

128. The method of any one of claims 126 to 127, further comprising administering to the subject a toll-like receptor (TLR) agonist.

129. The method of any one of claims 126 to 128, wherein the TLR agonist is a TLR2 agonist, a TLR3 agonist, a TLR7 agonist, a TLR8 agonist or a TLR9 agonist.

130. The method of any one of claims 127 to 129, further comprising administering to the subject a TLR7 agonist.

131. The method of claim 130, wherein the TLR7 agonist is selected from the group consisting of vesatolimod, imiquimod, and resiquimod.

132. The method of any one of claims 126 to 131, further comprising administering to the human subject an antibody or antigen-binding fragment thereof that binds, inhibits, and/or neutralizes HIV.

133. The method of any one of claims 127 to 132, further comprising administering to the human subject an effective amount of a second antibody or antigen-binding fragment thereof that binds, inhibits, and/or neutralizes HIV, wherein the second antibody or antigen-binding fragment thereof does not compete with the antibody or antigen-binding fragment of any one of claims 1-70 for binding to gp120.

~~134. The method of claim 133, wherein the second antibody or antigen-binding fragment thereof that binds, inhibits, and/or neutralizes HIV, competes with or comprises VH and VL variable domains of a broadly neutralizing antibody (bNAb) against HIV.~~

~~135. The method of any one of claims 133 to 134, wherein the second antibody or antigen-binding fragment thereof that binds, inhibits, and/or neutralizes HIV, binds to an epitope or region of gp120 selected from the group consisting of:~~

~~i. third variable loop (V3) and/or high mannose patch comprising a N332 oligomannose glycan;~~

~~ii. second variable loop (V2) and/or Env trimer apex;~~

~~iii. gp120/gp41 interface; or~~

~~iv. silent face of gp120.~~

~~136. The method of any one of claims 133 to135, wherein the second antibody or antigen-binding fragment thereof that binds, inhibits, and/or neutralizes HIV, binds to an epitope or region of gp120 in the third variable loop (V3) and/or high mannose patch comprising a N332 oligomannose glycan and competes with or comprises VH and VL regions from an antibody selected from the group consisting of GS-9722, PGT-121, PGT-122, PGT-123, PGT-124, PGT-125, PGT-126, PGT-128, PGT-130, PGT-133, PGT-134, PGT-135, PGT-136, PGT-137, PGT-138, PGT-139, 10-1074, VRC24, 2G12, BG18, 354BG8, 354BG18, 354BG42, 354BG33, 354BG129, 354BG188, 354BG411, 354BG426, DH270.1, DH270.6, PGDM12, VRC41.01, PGDM21, PCDN-33A, BF520.1 and VRC29.03.~~

~~137. The method of any one of claims 133 to 135, wherein the second antibody or antigen-binding fragment thereof that binds, inhibits, and/or neutralizes HIV, binds to an epitope or region of gp120 in the second variable loop (V2) and/or Env trimer apex and competes with or comprises VH and VL regions from an antibody selected from the group consisting of PG9, PG16, PGC14, PGG14, PGT-142, PGT-143, PGT-144, PGT-145, CH01, CH59, PGDM1400, CAP256, CAP256-VRC26.08, CAP256-VRC26.09, CAP256-VRC26.25, PCT64-24E and VRC38.01.~~

~~138. The method of any one of claims 133 to 135, wherein the second antibody antigen-binding fragment binds to an epitope or region of gp120 in the gp120/gp41 interface and competes with or comprises VH and VL regions from an antibody selected from the group consisting of PGT-151, CAP248-2B, 35O22, 8ANC195, ACS202, VRC34 and VRC34.01.~~

~~139. The method of any one of claims 133 to 135, wherein the second antibody or antigen-binding fragment thereof that binds, inhibits, and/or neutralizes HIV, binds to an epitope or region of the gp120 silent face and competes with or comprises VH and VL regions from antibody selected from the group consisting of VRC-PG05 and SF12.~~

~~140. The method of any one of claims 133 to 135, wherein the second antibody or antigen-binding fragment thereof that binds, inhibits, and/or neutralizes HIV, binds to an epitope or region of gp41 in the membrane proximal region (MPER).~~

~~141. The method of any one of claims 133 to 134, wherein the second antibody or antigen-binding fragment thereof that binds, inhibits, and/or neutralizes HIV, binds to an epitope or region of gp41 in the membrane proximal region (MPER) and competes with or comprises VH and VL regions from an antibody selected from the group consisting of 10E8, 10E8v4, 10E8-5R-100cF, 4E10, DH511.11P, 2F5, 7b2, and LN01.~~

~~142. The method of any one of claims 133 to 134, wherein the second antibody or antigen-binding fragment thereof that binds, inhibits, and/or neutralizes HIV, binds to an epitope or region of the gp41 fusion peptide and competes with or comprises VH and VL regions from an antibody selected from the group consisting of VRC34 and ACS202.~~

~~143. The method of claim 132, wherein the antibody or antigen-binding fragment thereof that binds, inhibits, and/or neutralizes HIV comprises the VH and VL of PGT121.60 or PGT121.66.~~

~~144. The method of claim 132, wherein the antibody or antigen-binding fragment thereof that binds, inhibits, and/or neutralizes HIV comprises the VH within SEQ ID NO:454 and the VL within SEQ ID NO:455.~~

~~145. The method of claim 132, wherein the antibody or antigen-binding fragment thereof that binds, inhibits, and/or neutralizes HIV comprises the VH within SEQ ID NO:454 and the VL within SEQ ID NO:456.~~

~~146. The method of any one of claims 126 to 145, further comprising administering to the human subject an anti-HIV vaccine.~~

~~147. The method of claim 146, wherein the anti-HIV vaccine comprises a viral vaccine.~~

~~148. The method of any one of claims 146 to 147, wherein the viral vaccine is from a virus selected from the group consisting of an arenavirus, an adenovirus, a poxvirus, and a rhabdovirus.~~

~~149. A method of inhibiting HIV in a human subject in need thereof, the method comprising administering to the subject an effective amount of the antibody or antigen-binding fragment thereof of any one of claims 1-77, or the pharmaceutical composition of any one of claims 78-97.~~