

**2018 Antibody Building (Immunoglobulin IgG1) antigen binding glycoprotein**

First Name: \_Teacher\_ Surname: \_Teacher\_ Group N° \_\_\_\_\_ **Medical Bio Chemistry**

Task for practical studies : <http://aris.gusc.lv/06Daugavpils/Research/ImmunoGlobulASmed.doc>



Molecule viewers: ChemScape RasMol MAGE ISIS Draw

Firefox v.3.5.5

at Display conditions: **Stick** (on Menu Stripe) **Ball & Stick** **Spacefill**

Atom Name	Symbol	Color	Valence Number
Carbon	C	Gray lightly or Black	4
Hydrogen	H	White	1
Oxygen	O	Red	2 (donor acceptor ligand up to 4)
Nitrogen	N	Bluish	3 + 1 (donor acceptor ligand up to 4)
Sulfur	S	Yellow	-2 , +6
Phosphor	P	Yellow Intensive dark	5 ( & 3 )
Sodium ion	Na <sup>+</sup>	Blue	+1 (coordination up to 6)
Magnesium ion	Mg <sup>2+</sup>	Green	+2 (coordination up to 6)
Calcium ion	Ca <sup>2+</sup>	Gray Dark	+2 (coordination up to 6)
Iron ion	Fe <sup>2+</sup>	Yellow Gray	+2 (coordination up to 6)
Iron ion	Fe <sup>3+</sup>	Yellow Gray	+3 (coordination up to 6)

the CPK color scheme 1965

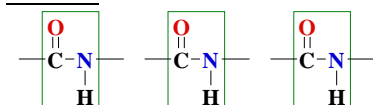
USA patent **Journal**

publication of scientists

**Corey, Pauling, Koltun**

for atomic modeling

Protein **Backbone** is **Ca trace**



Polypeptide of Amino Acids

*Side chains:* **Hydrophobic**

**Polar pH=7.36**

**Acidic-COO<sup>-</sup> negative**

**Basic-NH<sub>3</sub><sup>+</sup> positive**

Antigenic determined **A B AB O** blood groups: <http://aris.gusc.lv/06Daugavpils/Research/33BloodGroupABO.doc>

**1. Using HomeWork :** <http://aris.gusc.lv/06Daugavpils/Research/Amineac20LS.doc>

What 20 amino acids make up proteins call them using three letter and one letter Amino Acid abbreviations?

Which are simplest and largest amino acid of 20 write its molar mass g/mol?!

1	Gly - G	5	Ile - I	9	Met- M	13	Gln - Q	17	Phe - F
2	Ala - A	6	Ser - S	10	Asp- D	14	Arg - R	18	Tyr - Y
3	Val - V	7	Thr - T	11	Asn- N	15	Lys - K	19	Trp - W
4	Leu - L	8	Cys - C	12	Glu - E	16	His - H	20	Pro - P

simplest is glycine Gly – G 75,0666 g/mol and tryptophan Trp – W 204,225 g/mol.....

In Firefox3.5.5 <http://aris.gusc.lv/ChemFiles/ChimAntibodyMarz/INDEX.htm> choose of the

molecule **AntibodyMarz** home page and investigate **Immunoglobulin** molecule for

**Lysozyme binding Anti-Body**

**2.** How are made **backbone** of polypeptide sequence chains and which atom of amino acid is responsible for

**backbone** trace formation? Point four **αCarbons** of Amino Acids and draw **Backbone trace** tetra peptide 3D

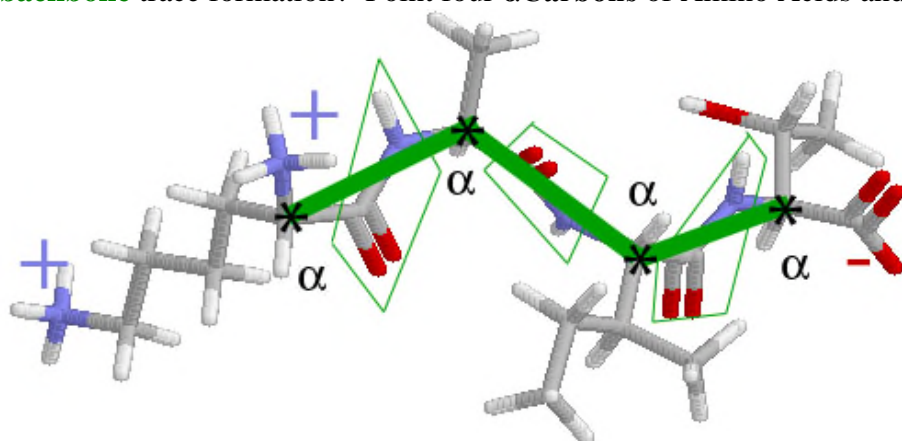
molecular model picture! Write the **tetra**

**Peptide** chain sequence using three letter

Amino Acid names

starting from **N-terminus** and

finishing with **C-terminus**!



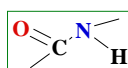
**H<sub>3</sub>N<sup>+</sup>-Lys1-Ala2-Ile3-Thr4-COO<sup>-</sup>** .....

Call terminus

**N-terminus** & **C-terminus** amino acid!

**N-terminus** Amino Acid: Lysine 1

**C-terminus** Amino Acid: Threonine 4



Draw inside frame-boxes three peptide bonds for given tetra peptide molecular model picture!

**3.** What amino acid is **N-terminus** and **C-terminus** on **Light** chains? GLU501....., SER716.....

**4.** What amino acid is **N-terminus** and **C-terminus** on **Heavy** chains? GLU1....., LEU452.....

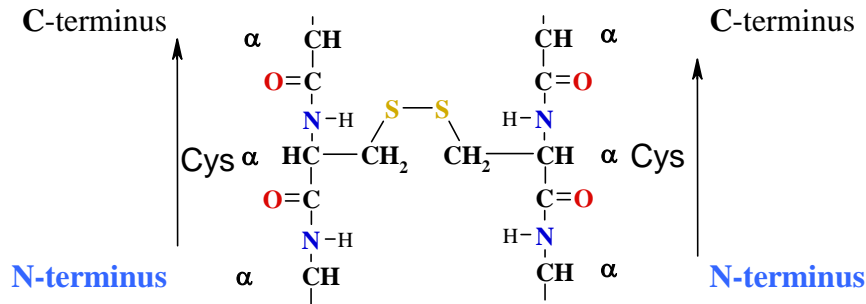
**5.** How many amino acids constitute **Light** and **Heavy** chains? **Light** 216=716-501+1....., **Heavy** 452.....

**6.** What five 5 intermolecular forces are known in biochemistry of life systems ?

1. **Hydrogen**, 2. **Hydrophobic**, 3. **Salt bridge**, 4. **Sulfur -S-S-** disulfide bridge, 5. **Coordinative donor-acceptor bond** ....

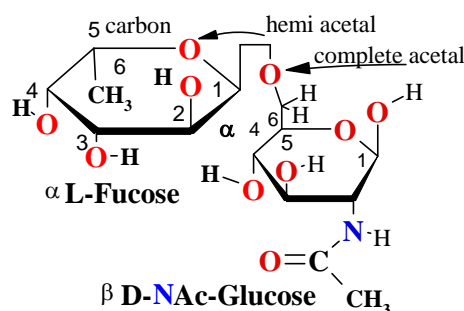
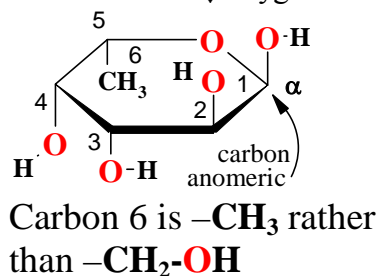
## 2018 Antibody Building (Immunoglobulin IgG1) antigen binding glycoprotein

6a. What means **disulfide, -S-S-bonds** ? Draw its structural presentation on your report notes between two 2 Cys amino acid residues implicated into two 2 neighbor protein chains as **backbone**?!



7. What is Immunoglobulin Domain **C<sub>L</sub>**? constant Light **CL** Chain domain .....
  8. How many **beta sheets** made each **Ig** core domain and how many **beta strands** constitutes them each ... respectively? two sandwich like **beta sheets** with four and three **strands** .....
  9. What mean and to what medium faced are oriented laying **polar/polar** or/and **charged negative** as **charged** ....  
...**positive amino acid** side chains? to water as electrostatic interaction forces .....
  10. Where are oriented **hydrophobic** side chains? water structure compress interior together.....
  11. How many intermolecular forces of five known fold protein chain? Four .....
  12. Call four **4** molecular interaction forces, which fold protein amino acid chains of **Immunoglobulin IgG1** into globular molecule? 1.**Hydrogen**,.....  
2. **-S-S-disulfide bridge**,.....3 **Salt bridge** ,.....4 **Hydrophobic**,.....
  13. Write four molecular structure units of intermolecular bonds containing 12 tertiary structure **domains** of immunoglobulin molecule! .....
1. acceptor  $>C=O \dots H-N <$  donor 2. .... Cys-**S-S**-Cys 3. ....  $-COO^- \dots H_3^+N-$  4. ...  $(H_2O)_4 \rightarrow \diamond \leftarrow (H_2O)_4$
14. What Physiological functions and localization in Cells as Organelles of Lysozyme enzyme?
    - a. .... in Lysosomes as enzymes Protein hydrolases - peptidases separate free amino acids .....
    - b. ... which in Lysosomes polypeptides separate into free amino acids .....
  15. What are **F(ab')<sub>2</sub>** in **IgG** chains? dimer of an antigen-binding fragment.....
  16. What are two **2 paratopes**? with two complementary antigen-binding sites .....
  17. What are **Fc** chains? the **constant/crystalline/complement-fixing** fragment .....
  18. How many **Light chains** and **Heavy chains** are? two **Light** and **Heavy** chains .....
  19. How many **disulfide bonds** has **F(ab')<sub>2</sub>** structure? 12 disulfide bonds .....
  20. What chains are bound with four **4 -S-S-**? **Light M** with **Heavy I** chains .....
  - ...two disulfide bonds connect **Heavy H** with **Heavy I**.....**Light L** with **Heavy H** chains .....
  21. What structural components compose **glycoproteins**? Carbohydrates + Proteins .....
  22. Which amino acid has **N-linked glycoside** bond? **ASN306** .....
  23. Write the immunologic marker fucose  $\alpha 2 \Rightarrow 6$  linked to GlcNAc Haworth projections::

Hemi acetal ↓ oxygen



Show in cyclic  $\alpha$ -L-Fucose hemi acetal oxygen **-O-** atom and complete acetal-glycoside oxygen **-O-** atom linked to  $\beta$  GlcNAc !