84284 Signaling Pathways in Health and Disease 14 CFU

Exam Questions

Academic Year 2019/2020

Exam method

Students who regularly attended the course of Cell Signalling will be evaluated through a **four-hour FINAL EXAM**, a cumulative **written test** with both **multiple-choice and open-ended** response formats that include topics from all the teaching modules of the integrated course of Signalling Pathways in Health and Disease.

Final Grade Fractions:

- Cell Signalling 9/32 pts;
- Metabolic Biochemistry 14/32 pts;
- Physiology 9/32 pts.

→ MAX GRADE: 30 cum laude.

The final exam for the module of Physiology will be an open-ended questions written test.

84285 Cell Signaling 4 CFU

Maria Luisa Genova

Exam Questions

- Cell Signaling 1 = A1 (30 minutes, tot 5 points, MCQ, explain Wrong answers)

1. Insulin structure
2. RAS
3. HSPs (type of substance they bind, location in the body/cell, action on substance, transmembrane steroid receptor)
4. Toxins, ADP rybosilation (pertussis toxin, subunits and target)
5. CytP450 (name, structure, location, action, etc.)

- Cell Signaling 2 = A2 and A3 (30 minutes, tot 4 points, 2 for A2 and 2 for A3)
  - A2 (June 2020): spot the error in the scheme (there was a scheme that contained both the PKA and PKC pathway and we had to spot the errors in the scheme and write how the pathway can be switched off): adenylyl cyclase number of transmembrane domains was wrong, there was dGDP or similar attached to G protein instead of GTP/GDP, PDE acted on G protein, beta-gamma was not anchored correctly

and its translocation direction was not right (it went to the cytosol and eventually away from PKC), PIP2 was spanning the two leaflets and not one only, Ca++ was flowing into the ER and not out in PKC signaling, etc. There were 5 mandatory points and you can add 10 more, each point is worth 0.1 score, so total 1.5 if you add everything

  - A2 (July 2020): Picture of the Insulin pathways, both the fast (AKT/PKB) and the slow response were shown. Then, describe the passages corresponding to the letters present in the image
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- A3:
  - June 2020: fill in the gaps + draw a scheme (or write down what you would draw in the scheme if you don't want to make the scheme) It was about PKB pathway.
  - July 2020: Interleukin IL-6 interaction with Jak-Stat pathway
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September 2020:

- A1 Cholera and pertussis toxins + GPCRs + ...
- A2 PKB/Akt insulin signalling in healthy and insulin-resistant hepatocytes
- A3 Text on steroid hormones and their derivatives

76149 Physiology 4 CFU

Davide Martelli

Exam Questions all taken from the course syllabus as titles.

Elaboration of the following topics: (45 min for both question)

- Qs1
  - Synapses chemical/electrical
  - Classification of neurotransmitters and of receptors (ionotropic and metabotropic)
  - EPSP and IPSP
  - neuromuscular junction
- Qs2
  - Electrochemical gradient
  - Membrane Potential
  - Action potential
  - Nerst equation

- Goldman equation
- Hodgkin cycle
- Neurons
- myocytes and smooth muscle.

84286 Metabolic Biochemistry 6 CFU

Giorgio Lenaz

Exam Questions

June 2020:

- Metabolism1 (1h, not in order, tot 9 points, MCQ, explain ALL answers, Not only wrong)

1. Type 1 diabetes
2. HMGcoA reductase (to distinguish its corresponding pathway from that of HMG-CoA lyase)
3. AcetylCoA carboxylase regulation and action
4. Pyruvate DH complex
5. what would you expect if F26BP is decreased
6. AAs and acetylCoA, where they enter the cycle
7. tetrahydrofolate
8. Does Urea cycle decrease or increase when we are in fasting state and why
9. ??

- Metabolism2 (1h, tot 5 points)
- Reactions to complete (1.5 pts)
- Write the cofactors and prosthetic groups required for the following enzymes and if they are vitamins state which vitamin it is (1.5 pts)
  - Transaldolase PLP vit B6
  - Transketolase TPP vit B1
  - AcetylCoA Carboxylase (Biotin)
  - Serine decarboxylase
  - Isocitrate dehydrogenase (NAD)
  - Serine hydroxymethyltransferase PLP vit B6
  - ....

- Synthesis of palmitate from alanine (write the steps and the ATP balance) (2pts)

July 2020:

- Metabolism1

1. pathway that would increase glycemia
2. muscle glycogen
3. pyruvate carboxylase
4. diabetes II and obesity
5. substrate of ribonucleotide reductase
6. chylomicrons
7. wrong question about that all the carbon atoms of glucose will be found in palmitic acid

- Metabolism2
  - pentose pathway, from g6p to f6p, write down all the reactions
- Metabolism3
  - glutamine to glucose, write down all the reactions and ATPs

September 2020:

- Caffeine and cAMP
- Uncontrolled type 1 diabetes
- Thymidylate synthase
- Reactions to complete
- Given some enzymes, state the coenzyme or cofactor and indicate the vitamin if appropriate
- Alanine to palmitate + ATP bal