

**HSS2305A-Quiz 2:**

**Last name:** \_\_\_\_\_

**First name:** \_\_\_\_\_

**student number:** \_\_\_\_\_

- 1) *There are 20 questions (10 multiple choice and 5 short-answer) that worth a total of 30 points.*
- 2) *Please transfer you MC answers to the scantrons*

**Part I multiple choice questions-10 points**

1. In which type of tissue is the extracellular matrix most prominent?
  - a) **Connective tissue**
  - b) Epidermis
  - c) Epithelial tissue
  - d) Both connective tissue and epidermis
  - e) All of these are correct.
  
2. Which of the following cell adhesion molecule promotes cell-cell recognition?
  - a) Integrin
  - b) Immunoglobulin
  - c) Selectin
  - d) **Cadherin**
  - e) Fibronectin
  
3. Both the glucagon and epinephrine receptors \_\_\_\_\_.
  - a) Directly activate the production of cAMP from ADP
  - b) Indirectly activate the production of cAMP from ADP
  - c) **Directly activate the same type of heterotrimeric G protein**
  - d) Indirectly activate the same type of heterotrimeric G protein
  - e) Directly activate the same type of monomeric G protein
  
4. What might be the result if cells that you are culturing acquire a mutation in a protein-tyrosine kinase that prevents the protein from being regulated in a normal fashion and keeps it continually in an inactive state?
  - a) Uncontrolled cell division
  - b) **Cessation of cell division**
  - c) Transformation into cancer cells
  - d) A significant decrease in cell size
  - e) The cells undergo apoptosis
  
5. Which of the following is NOT true about calcium?
  - a) Is involved in diverse functions such as: fertilization, cell death, secretion.
  - b) Can be released by both GPCR and RTK signaling
  - c) Can be regulated by calcium itself
  - d) Main storage site is the endoplasmic reticulum
  - e) **Ras kinase pathway increases calcium levels.**

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6. Which of the following domains in nuclear receptors has the most diverse sequence?
- a) The AF-1 domain
  - b) Hormone response elements (HRE)
  - c) P- and D-boxes
  - d) Ligand-binding domain**
  - e) Zinc fingers
7. All of the following are endocrine disruptors **except**
- a) Arsenic
  - b) Dioxin
  - c) Pesticides
  - d) *trans*-retinoic acid**
  - e) Polychlorinated bi-phenyls
8. Focal adhesion Kinase (FAK) signaling pathway:
- a) Is activated by selectins
  - b) Can be activated by monomeric G proteins
  - c) Results in inhibition of ERK/MEK
  - d) Involves cytoskeletal proteins**
  - e) Involved in cell-cell recognition
9. What is the most direct agent/process that leads to insulin resistance in metabolic syndrome?
- a) Inflammation
  - b) Advanced glycation endproducts
  - c) Foam cell formation
  - d) Free fatty acids**
  - e) DNA damage and telomere shortening
10. Endocrine disrupting chemicals can increase the risk of metabolic syndrome by:
- a) Inhibition of the secretion of resistin and stimulating the secretion of adiponiktin
  - b) Stimulating the activity of peroxisome proliferator-activated receptor-2 isoform (PPAR-2)
  - c) Stimulating lipolysis and adipocyte differentiation**
  - d) Attacking  $\beta$ -islet cells
  - e) Inhibition of insulin release

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**Part II-short assay questions-20 points**

1. Give **one** example of:

- a-An ion second messenger      **Calcium**
- b A gas second messenger      **Nitrous oxide or Nitric oxide**
- c-An organic second messenger      **cAMP, or IP3, or IP2**

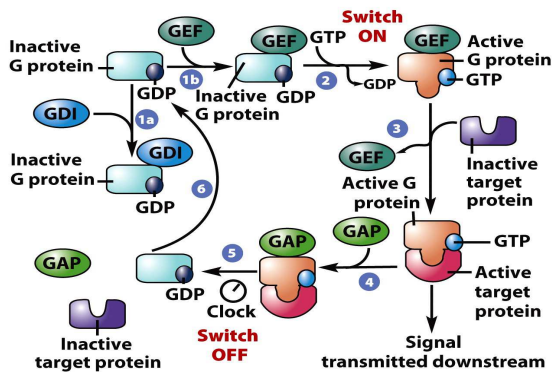
**One example of each is enough**

**(3 points)**

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2. What would be the impact on cellular activity of a mutation that inhibits the function of GAP in the figure below: (4 points)



GAP inhibition would prevent exchange of GDP for GTP in the G protein, **therefore G protein won't be switched off and remain active. G protein is an element in the Ras MAP pathway that activates genes involved in cell proliferation. Continuous stimulation of this pathway may lead to increased rate of cell replication and therefore cause cells to be cancerous (contribute to tumor development).**

**Slides 33-36 of class 12 explains this in details**

3. If you were to design an antibody to interfere with platelet aggregation, what would be the domain/sequence to which your antibody should bind? (3 points)

**RGD sequence on integrin molecule-slide 39 class 14 also we talked about this several times in the class**

4. How advanced glycation endproducts (AGEs) are formed? What disease they contribute to? How they contribute to that disease-6 points total? **Slide 16 of class 16**

**AGEs are formed from the nonenzymatic reaction of reducing sugars with free amino groups of proteins, lipids, and nucleic acids.....(2 points)**

**They contribute to diabetes mellitus, or cardiovascular disease, or metabolic syndrome. (Any one of these diseases is enough).....(1 point)**

Numerous animal and human studies have shown that **AGEs and their receptors critically contribute to amplify inflammatory responses through enhanced generation of proinflammatory products** such as adhesion molecules, cytokines, and tissue-destructive matrix metalloproteinases. **This induces inflammation with influx of monocytes that attacks these inflammatory products. Atherosclerotic lesion begins with "fatty streak" lesions in the artery walls, due to the presence of inflammatory cells and the accumulation of lipid-containing intimal macrophages (foam cells).....(3 points)**

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5. Briefly explain the impact of a mutation in a nuclear receptor that makes it unable to dissociate from histone deacetylase (HDAC). **(4 points)**

HDAC is the co-repressor which is always binds to the nuclear receptors (NR) in absence of a ligand. **If the nuclear receptor is mutated so that it unable to release HDAC, then NR won't be able to induce gene transcription** since HDAC always removes acetyl groups on histones thus condensing the chromatin (which is associated with gene repression). **This will lead to inhibition of the activity associated with that nuclear receptor (endocrine disruption).**

**Slide 17 of class 15**