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Name: _____ Date: _____

Quiz name: Quiz 10

1. The overall process in which information carried by extracellular messenger molecules is translated into changes that occur inside the cell is called _____.

(A) signal digestion
(B) signal destruction
(C) signal interaction
(D) signal transduction
(E) signal induction

2. Which amino acids are known to be phosphorylated by protein kinases?

(A) tyrosine, threonine, glycine
(B) threonine, serine, tryptophan
(C) serine, threonine, tyrosine
(D) phenylalanine, serine, tyrosine
(E) serine, leucine, tyrosine

3. Where is the guanine nucleotide-binding site of the G protein located?

(A) on the Gα subunit
(B) on the Gβ subunit
(C) on the Gγ subunit
(D) on the Gβγ subunit
(E) on all three subunits

4. Place the following events in the proper order.
1) Activation of one or more cellular signaling proteins.
2) Dissociation of Gα from the G protein complex.
3) Production of a second messenger, like cAMP.
4) Replacement of GDP by GTP on the Gα after interaction with an activated GPCR.
5) Conformational change in the Gα subunit causing a decreased affinity for the Gβ γ subunit.
6) Gα-subunit with its attached GTP activates an effector like adenylyl cyclase.

(A) 4 – 5 – 2 – 6 – 3 – 1
(B) 5 – 4 – 2 – 6 – 3 – 1
(C) 4 – 6 – 2 – 5 – 3 – 1
(D) 4 – 5 – 2 – 3 – 1 – 6
(E) 1 – 5 – 2 – 4 – 3 – 6

5. How is signaling by an activated Gα subunit terminated?

(A) The bound GTP is hydrolyzed to GMP.
(B) The bound GDP is hydrolyzed to GTP.
(C) The bound GTP is hydrolyzed to GDP.

(D) The bound GDP is phosphorylated to GTP.

(E) The Gα subunit releases GDP and binds GTP.

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6. Once the kinase domain of receptor protein-tyrosine kinase has been activated, what does the activated receptor protein-tyrosine kinase do?

(A) The receptor subunits denature.

(B) Each receptor subunit phosphorylates its partner on tyrosine residues found in regions adjacent to the kinase domain.

(C) Each receptor subunit phosphorylates itself on tyrosine residues found in regions adjacent to the kinase domain.

(D) The receptor subunits dephosphorylate each other.

(E) The receptor subunits refold into a more effective conformation.

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7. What kind of enzyme is the RAS gene product, the Ras protein?

(A) an ATPase

(B) a kinase

(C) a phosphodiesterase

(D) a GTPase

(E) a phosphatase

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8. What holds Ras at the inner surface of the plasma membrane?

(A) weak interactions with the phospholipid head groups

(B) weak interactions with integral membrane proteins

(C) hydrophilic interactions of the Ras protein with the interior of the phospholipid bilayer

(D) attachment to a lipid group that is embedded in the inner leaflet of the bilayer

(E) attachment to a carbohydrate group that is embedded in the inner leaflet of the bilayer

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9. How is Ras activity turned off?

(A) It is turned off by phosphorylation.

(B) It is turned off by hydrolysis of its bound GTP to GDP.

(C) It is turned off by hydrolysis of its bound GDP to GTP.

(D) It is turned off by an allosteric inhibitor.

(E) It is turned off by hydrolysis of its bound GTP to GMP.

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10. What event is usually responsible for terminating signal transduction by RTKs?

(A) dephosphorylation of the receptor

(B) degradation of the ligand

(C) receptor internalization

(D) phosphorylation of the receptor

(E) acetylation of the receptor

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Name: _____ Date: _____

Quiz name: Quiz 11

1. How is caspase-activated DNase (CAD) activated?

(A) A caspase cleaves CAD, activating it.
(B) A caspase cleaves an activator of CAD, turning it on and causing it to activate CAD.
(C) A caspase cleaves a CAD inhibitor, relieving the CAD of inhibition.
(D) A caspase binds to CAD allosterically, activating it.
(E) None of these are correct.

2. Cell signaling makes it possible for _____.
1) cells to closely regulate their growth and division
2) cells to respond in an appropriate manner to a specific environmental stimulus
3) various cells to work together and coordinate their activities
4) All of these are correct.

(A) 1
(B) 2
(C) 3
(D) 1 and 3
(E) 4

3. To what amino acid residue in its protein substrates do RTKs add phosphate groups?

(A) serine
(B) tyrosine
(C) threonine
(D) tryptophan
(E) glycine

4. What happens to cells when the receptors are returned to the cell surface after they are internalized?

(A) The cells are able to make a magnified response to the same stimulus from the ligand in question.
(B) The cells permanently lose sensitivity for the ligand in question.
(C) The cells lose, at least temporarily, sensitivity for the ligand in question.
(D) The cells retain sensitivity to the ligand in question.
(E) The cells expand.

5. Which of the following is not a second messenger that has been found in eukaryotic cells?
1) diacylglycerol
2) cyclic GMP
3) nitric oxide
4) epinephrine

(A) 1
(B) 2

C 3
D 4
E 1, 2 and 3

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6. Binding of epinephrine and/or glucagon to its specific receptor in the plasma membrane of a target cell results in _____.
1) the activation of glycogen synthase
2) the activation of protein kinase A
3) the release of glucose into the bloodstream
4) the inhibition of glycogen synthase

A 1
B 2
C 3
D 4
E 2, 3 and 4

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7. Which enzyme is activated directly by cyclic AMP?

A glycogen synthase
B glycogen phosphorylase
C phosphorylase kinase
D glycogen phosphatase
E protein kinase A

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8. Protein-tyrosine kinases are enzymes that _____on protein substrates.
1) dephosphorylate specific tyrosine residues
2) phosphorylate specific tyrosine residues
3) add tyrosine residues to phosphate groups
4) add phosphate groups to tyrosine residues

A 1
B 2
C 3
D 4
E 2 and 4

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9. What kind of enzyme is Ras?
1) a G protein
2) a kinase
3) a GTPase
4) a phosphatase

A 1
B 2
C 1 and 3
D 3
E 44

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10. You have produced antibodies against the GLUT4 glucose transporter and labeled them with a green fluorescent dye. You culture the cells in the presence of insulin and after a 30-minute incubation period, you fix the cells and treat them with the fluorescent antibody. What do you see when you look at the cells in the fluorescence microscope?

A. The cells are uniformly green; the antibodies are equally distributed between the cell cytoplasm and membrane.

B. The green fluorescent label is concentrated in the cytoplasm around membrane vesicles.

C. The red fluorescent label is concentrated on the surface of the cell in the plasma membrane.

D. The green fluorescent label is concentrated inside the nucleus.

E. The green fluorescent label is concentrated on the surface of the cell in the plasma membrane.

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Name: _____ Date: _____

Quiz name: Quiz 12

1. The activation of a variety of different effectors by signals from a single receptor binding a single ligand is referred to as _____.

(A) divergence
(B) convergence
(C) crosstalk
(D) transvergence
(E) coherence

2. An example of _____ would be a situation in which components produced in one pathway can participate in events occurring in other pathways.

(A) divergence
(B) convergence
(C) crosstalk
(D) transvergence
(E) coherence

3. Death by apoptosis is a neat, orderly process characterized by _____.

(A) the overall shrinkage in volume of the cell & its nucleus
(B) the loss of adhesion to neighboring cells
(C) the rapid engulfment of the "corpse" by phagocytosis
(D) the dissection of the chromatin into small fragments
(E) All of these are correct.

4. Which of the following is(are) examples of stimuli that can initiate apoptosis?
1) DNA abnormalities
2) a speeding up of glycolysis rate
3) certain proteins secreted by reproductive cells
4) certain cytokines

(A) 1
(B) 2
(C) 3
(D) 4
(E) 1 and 4

5. At which site do virtually all of the signals that regulate the activities in which a cell is engaged originate?

(A) at the cell surface
(B) in the nucleus
(C) in the nucleolus
(D) in the endoplasmic reticullum

(E) in the cell wall

6. What is the largest protein superfamily encoded by animal genomes?

(A) G-protein coupled receptors
(B) RTKs
(C) steroid receptors
(D) tubulin superfamily
(E) ligand-gated channels

7. _____ form a small group of proteins that bind to GPCRs and compete for binding to those GPCRs with heterotrimeric G proteins.

(A) stablins
(B) arrestins
(C) monomeric G proteins
(D) G protein-coupled receptor kinases
(E) desensitizers

8. In what form do animal cells store glucose?

(A) glucogen
(B) glycogen
(C) agarose
(D) amylose
(E) amylopectin

9. What phosphorylates the tyrosine residues found on docking proteins?

(A) a G protein coupled receptor
(B) a receptor protein-tyrosine kinase
(C) a cytoplasmic protein-tyrosine kinase
(D) adaptor proteins
(E) receptor protein phosphatases

10. How is the distribution of free calcium ions in the living cell detected?

(A) fluorescent probes that emit light in the presence of calcium ions
(B) antibodies bound to ferritin
(C) an electron microscope
(D) autoradiography and the distribution of radioisotope
(E) NMR imaging