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(Most Important Questions on Cellular Organization)

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Cellular Organization

1. Following are the mechanism occurring during the regulation of activity of cyclin –CDK complexes.
identify the incorrect statement?
P) Cyclin synthesis and degradation catalysed by Skp1 cullin F-box **(SCF)** ubiquitin ligase and Anaphase promoting complex **(APC).**
Q) a highly conserved kinase called **Wee1** brings about this inhibitory phosphorylation, and a highly conserved phosphatase called **Cdc25** mediates dephosphorylation.
R) CDK inhibitor proteins (CKIs) binding makes cyclin-CDK complex active.
S) CDK inhibitor proteins that regulate CDKs in plants belong to CIP/KIP family and INK4 family.
A) P only
B) Q an R
C) R and S
D) P and S

2. Scientists subjected several drugs for screening inhibitors of cytokinesis in animals. It was found that Drug 'X' inhibited cytokinesis it binds the microtubule and prevents depolymerisation. Which could be X?
A) Taxol
B) Monastrol
C) Phalloidin
D) Cytochalasin

3. Seckel Syndrome is caused by a mutation in the gene coding for which of the following protein?
A) ATR
B) ATM
C) Chk1
D) Chk2

4. Rapid lateral movements of membrane lipids and proteins can be visualised by which of the following technique?
A) FRAP
B) SEM
C) TEM
D) None of the above

5. Most abundant integral membrane protein present on the plasma membrane of RBC
A) Spectrin
B) Ankyrin
C) Glycophorin
D) Band 3 protein

6. In a study conducted by scientists in the human brain, they found various isoforms of the glucose transporter (GLUT) family inside humans. which of the following class could be glucose transporter in the brain?
A) GLUT-1 B) GLUT-2
C) GLUT-3 D) GLUT-5

7. Digitalis and ouabain are known cardionic steroids used in the treatment of congestive heart disease because they increase the force of contraction of heart muscle by :
A) Inhibiting Na^+-K^+ pump
B) Activating Cl^- channels
C) ATPase pump
D) Opening ion channels

8. Triskelion is a three-legged structure consisting of three copies of heavy and light chain formed during which of the endocytic pathway
A) Phagocytosis
B) Pinocytosis
C) Caveolae mediated endocytosis
D) Clathrin-mediated endocytosis

9. The sorting of soluble lysosomal enzymes in the trans-Golgi network shares many features with the trafficking of proteins between the ER and cis-Golgi compartments mediated by COPII and COPI vesicles. Following events occurring during sorting of lysosomal enzymes has been placed in a sequential manner. Identify the incorrect statement given below.
P) G6P (Glucose 6 phosphate) acts as a sorting signal by interacting with the luminal domain of a receptor protein in the donor membrane.
Q) the membrane-embedded receptors with their bound ligands are incorporated into the appropriate vesicles either GGA- or AP1-containing clathrin-coated vesicles by interacting with the vesicle coat.
R) These transport vesicles fuse with only one specific organelle, the late endosome, as the result of interactions between specific v-SNAREs and t-SNAREs.
S) Intracellular transport receptors dissociated from their bound ligand are recycled by retrograde vesicle trafficking.
A) R only
B) P only
C) Q,R,S
D) R and S

10. KDEL sorting signal direct secreted and membrane proteins to specific transport vesicles by COPI coated vesicle. Which of the following is the role of KDEL?
A) retrieval of ER-resident luminal proteins from the Golgi.
B) Recognition by signal peptidase of the signal sequence
C) Translocation of protein from cis Golgi to ER.
D) Insertion of proteins in the membrane of ER

ANSWERS

1. C	2. A	3. A	7. A	8. D	9. B
4. A	5. C	6. C	10. A		

Solutions

1. CDK inhibitor proteins (CKIs) binding makes cyclin-CDK complex inactive. Plants contain 2 types of CDKs, CDKA and CDKBs. CDK inhibitor proteins that regulate CDKs in mammals belong to CIP/KIP family and the INK4 family.

2. Taxol inhibits cell division by stabilizing microtubules. Phalloidin is an F-actin stabilizer and Cytochalasin is an F-actin polymerization inhibitor. Monastrol inhibits a microtubule-based motor protein called kinesin-5.

3. Seckel Syndrome is caused by defects of genes on chromosomes 3 and 18. One form of Seckel syndrome can be caused by a mutation in the gene encoding the ataxia telangiectasia and Rad3 related protein (ATR) which maps to chromosome 3q22.

4. Fluorescence recovery after photobleaching (FRAP) is a method for determining the kinetics of diffusion through tissue or cells it is with help of fluorescence microscopy.

5. Glycophorins is the major single-pass transmembrane protein of RBC. It was the first membrane protein for which a complete aminoacid sequence was determined consisting of 131 amino acid residues.

6. GLUT-1 is the transporter of glucose in the erythrocyte, GLUT-2 is present in the liver, GLUT-3 is the transporter of brain, GLUT-5 present in the small intestine. GLUT-4 is the predominant isoform of skeletal muscle and adipose tissue.

7. Digitalis and ouabain are potent inhibitors of the Na+-K+ pump. These compounds inhibit the dephosphorylation of Na+-K+ pump when applied on the extracellular face of the membrane. It happens the level Na+ increases inside the cell, this slows the Na- Ca+ exchanger, leading to an increase in the concentration of Ca+ inside which ultimately increases the force of contraction of the heart muscle

8. Purified clathrin molecules, which have a three-limbed shape, are called triskelions, Each limb contains one clathrin heavy chain (180,000 MW) and one clathrin light chain (～35,000–40,000 MW). Triskelions polymerize to form a polygonal lattice with an intrinsic curvature. When clathrin polymerizes on a donor membrane, it does so in association with AP complexes, which fill the space between the clathrin lattice and the membrane.

9. The sorting signal that directs soluble lysosomal enzymes from the trans-Golgi network to the late endosome is a carbohydrate residue, **mannose 6-phosphate (M6P**) not Glucose 6 Phosphate (G6P), M6P is formed in the cis-Golgi.

10. Most soluble ER-resident proteins carry a Lys-Asp-Glu-Leu (KDEL in the one-letter code) sequence at their C-terminus. Several experiments have demonstrated that this KDEL sorting signal is both necessary and sufficient to cause a protein bearing this sequence to be located in the ER. The KDEL receptor, located mainly in the cis-Golgi network and in both COPII and COPI vesicles, binds proteins bearing the KDEL sorting signal and returns them to the ER .

This retrieval system prevents depletion of ER luminal proteins such as those needed for proper folding of newly made secretory proteins. The binding affinity of the KDEL receptor is very sensitive to pH. The small difference between the pH of the ER and that of the Golgi favours the binding of KDEL-bearing proteins to the receptor in Golgi-derived vesicles and their release in the ER.

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