

16 24

Cell Biology 282B MIDTERM EXAM # 1

**EXAM CODE 111**

February 12th, 2006

**READ INSTRUCTIONS CAREFULLY:**

1. The proctors **WILL NOT** address questions regarding the exam. If issues arise with specific questions, they will be dealt with when Dr. Kelly returns on February 21<sup>st</sup>.
2. Completely fill in the bubbles with an ordinary lead pencil. Marks made with a ballpoint pen or felt tip marker will NOT be detected. Do not make stray marks and completely erase errors.
3. Print your name and course in the blanks on the top of the SCANTRON sheet.
4. STUDENT NUMBER: **Print** the digits of your student number in the squares provided. **Mark** the corresponding bubble in the column below each printed digit.
5. SECTION: Fill in your course section:  
001 (1:30pm lecture NATSCI 145) or 002 (11:30am lecture NCB 101)
6. CODE: Fill in the exam code you are writing (top of this sheet).
7. Mark the one best choice from the alternatives provided for each question.
8. There are 35 questions in this test. Check your paper to ensure all questions are present. It is your responsibility to transfer all answers from the examination paper to the SCANTRON sheet WITHIN THE TWO HOUR time period.
9. THE SCANTRON sheet MUST be handed in at the end of the examination. You may keep the question booklet.
10. Wrong answers WILL NOT be deducted from your score.

**\*\*NOTE\*\***

When filling in the SCANTRON answer sheet, failure to PROPERLY include and "bubble in" your student number, section or exam code will result in a loss of 5% from your exam grade. Be sure to triple check!!!

✓ Q1 Ubiquitin, the signal to target cyclin for destruction,

- a) binds the destruction box on p34<sup>cdc2</sup>
- ☒ b) binds cyclin's destruction box
- c) binds the phosphatase encoded by cdc25
- d) binds the CAK inhibitory kinase
- ☒ e) none of the above

*binds cyclin's c-terminus*

✓ Q2 Myeloma cells used to make monoclonal antibodies:

- a) are arrested in meiosis
- b) survive in HAT media
- c) die after 50-100 cell divisions
- ☒ d) are immortal
- e) none of the above

✓ Q3 Endocytotic coated pits are composed of:

- ☒ a) Clathrin
- b) Calmodulin
- c) Tubulin
- d) Vimentin
- e) Cdk2

✓ Q4 Differential centrifugation specifically separates components based on their:

- a) pI
- b) pH
- ☒ c) Mass
- d) Density
- e) All the above

Q5 How many of the following apply to the scanning confocal microscope?

visible light; a laser; heavy metal salts; phosphorescent screen; analyzer; fluorescence

- a) 0
- ☒ b) 2
- ☒ c) 3
- d) 4
- e) 6

DIC Phase

confocal

✓ Q6 You are studying yeast cell cycle regulation, and you mutate the CAK gene so that it no longer produces a functional protein. Which phenotype would you expect to see resulting from this mutation?

- a) Wild-type sized yeast cells that grow normally
- ☒ b) Yeast cells that continue growing, but do not divide and eventually die
- c) Yeast cells that divide prematurely and eventually die
- d) Wild-type sized yeast cells that grow in HAT media

✓ Q7 Spumavirus, which causes *Chimpanzee foamy virus*, is a retrovirus that is endocytosed only by certain specific monkey cells because these cells contain a cell surface receptor that recognizes a viral coat protein. If you isolated this coat protein and have it in abundance and it is not denatured, what is the best method listed below to isolate its receptor for further analysis?

- a) Ion exchange chromatography
- b) Southern blotting ✕
- ✓ c) Affinity chromatography
- d) IEF
- e) Northern blotting ✕

Q8 How many of the following directly relate to protein trafficking to the RER?  
ampholytes; phosphatases; ubiquitin; carboxylation; SRP; fluorophores; protein A

- ✓ a) 0
- b) 1
- c) 3
- d) 5
- ✓ e) 7

✓ Q9 Hydroxylation, a post-translational modification to proteins, occurs in the \_\_\_\_\_ and results in OH groups being added to \_\_\_\_\_.

- a) Cis-Golgi, leucine
- b) Lysosome, tryptophan
- c) Nucleus, histidine
- d) Proteasome, glycine
- ✓ e) RER, proline

✓ Q10 NF- $\kappa$ B is a master transcriptional regulator of our immune system. Normally it is kept in an inactive state by an inhibitor called I- $\kappa$ B $\alpha$ . During an immune response I- $\kappa$ B $\alpha$  is phosphorylated and poly-ubiquitinated causing its release from NF- $\kappa$ B, which enters the nucleus and transcribes a number of essential genes. The modified I- $\kappa$ B $\alpha$  would be found in the:

- a) Trans-Golgi
- b) RER
- c) Nuclear pore
- ✓ d) Proteasome
- e) Medial-Golgi

Q11 For Immunoblot analysis, proteins are first separated by:

- a) IEF
- ✓ b) SDS-PAGE ✕
- c) Ion exchange
- ✓ d) Gel filtration
- e) Yeast two-hybrid ✕

**Q12** You are testing polypeptide modification during translation and have the following at your disposal: cell free system and microsomes; a 600 nucleotide mRNA (306 nucleotides of which encode for a secreted protein that has a 45 amino acid signal sequence); GTP; <sup>35</sup>S-methionine, all the other amino acids and SRP receptors. Using SDS-PAGE and techniques to detect newly synthesized proteins, and assuming each amino acid has a mass of 100 daltons, what is the size of the newly translated protein?

- a) 60000      b) 4500      **c) 5700**      d) 30600      e) 10200

102  
45  
57

**Q13** A DIC microscope is used to visualize:

- a) the green fluorescent protein  
b) protein A gold attached to catalase  
**c) unstained cells**  
d) uranium coated thin sections  
e) DNA microarray slides

**Q14** The centrosome is:

- a) present in the cleavage furrow  
**b) a microtubule organizing centre** ✓  
c) another name for a centromere  
d) immediately adjacent to the kinetochore  
e) none of the above

**Q15** Enzymes targeted to the lysosome contain:

- a) the ApoB signal  
b) the C-terminal propeptide signal  
c) the Destruction box signal x  
d) the KDEL sequence signal x  
**e) none of the above**

**Q16** During translation, how many of the following would enter the RER?  
lamin; SRP receptors; RNA polymerase; myosin; tubulin; p53; collagen; SRP; p34

- a) 0**      b) 2      c) 4      d) 6      e) 8

**Q17** How many of the following are common to E. coli and hepatocytes (liver cells)?  
RNA; centrioles; nucleus; RER; mitochondria; Golgi complex

- a) 0      **b) 1**      c) 2      d) 4      e) 6

**Q18** p21, also called the CIP, serves as a:

- a) polyubiquitination protein  
b) cdk activator  
**c) tumour suppressor protein**  
d) nuclear envelope protein

✓ Q19 A cleavage furrow, forming during cytokinesis, would be affected specifically by:

- a) chemicals that block the uptake of ApoB <sup>LDL</sup>
- ☒ b) chemicals that prevent myosin binding to tubulin <sup>Actin myosin II</sup>
- c) chemicals that make M6P-containing proteins
- d) chemicals that cause DNA hydrolysis
- ☒ e) none of the above

✓ Q20 Which of the following directly applies to an autoradiography experiment?

- a) Barrier filter and a fluorescent microscope
- b) Ultracentrifuge and sucrose
- ☒ c) Photographic emulsion and an isotope /
- d) SDS and ampholytes
- e) Monoclonal antibody and gel filtration chromatography

✓ Q21 Hypercholesterolemia is a disease specifically associated with:

- a) a loss of cell cycle regulation in the pancreas
- b) uncontrolled exocytosis of M6P-containing proteases in the lungs
- ☒ c) the failure to endocytose LDL particles by cells in the body
- d) a loss of DNA repair mechanisms due to a mutated p34 gene in skin cells
- e) excess apoptosis of normal brain cells

✓ Q22 How many of the following are directly in reference to lamins?

a nuclear envelope component; are denatured by cdc25; are composed of collagen; attach chromatids to the mitotic spindle; link RER to the Golgi; are present in endocytotic pits; form dimers when phosphorylated; are resident ER chaperones

- a) 0
- ☒ b) 2
- c) 4
- d) 6
- e) 8

✓ Q23 A CURL is a type of organelle that plays a fundamental role in:

- ☒ a) ligand-specific phagocytosis
- b) prokaryotic cell cycle regulation
- c) protein transcription
- ☒ d) receptor mediated endocytosis
- e) none of the above

Curl = late endosome

- pH release receptor-mediated

✓ **Q24** This time of year roses are in stores everywhere, and surprisingly no one has studied their histone proteins. You create an excellent and specific histone H1 antibody, and together with protein A gold, plan to use transmission electron microscopy to examine histone H1 localization in rose cells. Following a trip to the TEM, your micrographs reveal that the protein is localized to the:

- a) Cis-Golgi cisterna
- b) Rough endoplasmic reticulum
- ✓ c) Nucleus
- d) Lysosomes
- e) Cell wall

✓ **Q25** To get the best resolution possible from a brightfield microscope, one would:

- a) try to collect more light onto the barrier filter
- ✓ b) increase the refractive indices (n) of the media surrounding the cell
- c) increase the wavelength of light
- d) all of the above
- e) none of the above

✓ **Q26** DNA microarrays are used to detect:

- a) protein:protein interactions
- b) the pI of transcription factors
- ✓ c) differences in gene expression between two samples
- d) myeloma and B-cell hybridomas
- e) none of the above

✓ **Q27** During translation carbohydrates and sugars are added to proteins that are secreted or placed on the cell surface. Which one of the following is likely to be the correct transport route of a protein that sits on the surface of your red blood cells?

- a) Ribosome, ER, trans-Golgi, medial-Golgi, placement in the plasma membrane ✕
- b) ER, trans-Golgi, cis-Golgi, lysosome, placement in the plasma membrane ✕
- c) Cis-Golgi, trans-Golgi, proteasome, placement in the plasma membrane ✕
- ✓ d) ER, cis-Golgi, medial-Golgi, trans-Golgi, placement in the plasma membrane
- e) Ribosome, ER, medial-Golgi, peroxisome, placement in the plasma membrane ✕

✕ **Q28** A yeast two-hybrid assay relies on the expression of a reporter gene to tell the experimenter that two proteins have interacted. In the system that was discussed in class, the expression of the reporter allowed the yeast containing the two-hybrid interactors to grow in media missing:

- a) Proline
- b) Leucine
- c) Glycine
- d) Lysine
- ✓ e) None of the above

✓ **Q29** During the nuclear bomb tests in the 1950's, it was realized that soldiers exposed to high levels of ionizing radiation were developing skin cancer. You have access to skin samples from these individuals and samples from others that serve as your control group, together with access to the polyclonal antibodies listed below, and all the reagents and apparatuses to do a Western Blot. What antibody would you choose as the best diagnostic reagent to show that a protein, characteristic of the cancerous state, was present in the soldiers' skin cells and not in those from the control patients?

- a) Mouse anti-donkey actin
- b) Rat anti-mouse myosin 1
- c) Human anti-rabbit p34
- ☒ d) Sheep anti-chimpanzee p53
- e) Horse anti-human ubiquitin

✓ **Q30** MPF is a heterodimer made up of:


- a) cyclin and cdc2
- b) cdc2 and cdc25
- ☒ c) p34<sup>cdc2</sup> and cyclin<sup>cdc13</sup>
- d) wee1 and CAK
- e) none of the above

✓ **Q31** The original genetic screen with yeast, to identify cell division cycle (cdc) genes, yielded many players that we know are key in our own cell cycle regulation. These genes were isolated and identified by \_\_\_\_\_ of cdc mutants.

- a) equilibrium density centrifugation
- b) homeotic transformation
- ☒ c) functional complementation
- d) cell purification
- e) oxidative phosphorylation

✓ **Q32** Growth hormone (GH) plays a major role in our body, yet blocking the polypeptide's entrance into the bloodstream would have frightful consequences. If an individual's pituitary cells were unable to \_\_\_\_\_ it would severely hinder his/her's ability to make a secreted form of GH and thus they would likely suffer from growth retardation or dwarfism.

- a) synthesize SRP
- b) raise the pH in the CURL
- ☒ c) phosphorylate KDEL
- d) methylate MPF
- e) target clathrin to a proteasome

 **Q33** Ras, a small GTPase in our cells, serves as a signaling molecule. When Ras is activated it tells the cell to get ready for mitosis. However, in many cancers Ras is mutated at amino acid 12, where glycine (G) is replaced by aspartic acid (D). This mutant Ras<sup>G12D</sup> protein is now permanently on and the cell undergoes uncontrolled growth. You receive tumour cells as well as normal cells from a patient and you have to pick the best technique to see if the cells in the tumour had developed due to the Ras<sup>G12D</sup> mutation. The most reliable method to answer this question is:

- a) gel filtration chromatography ✕
- b) scanning electron microscopy ✕
- ☒ c) isoelectric focusing electrophoresis
- d) rate zonal centrifugation ✕
- e) none of the above

✓ **Q34** In the cell cycle, chromatids begin their movement to their respective poles at \_\_\_\_\_; movement is the result of microtubules attached to the chromatids' \_\_\_\_\_.

- a) Prophase, chromomeres
- b) Telophase, fluorophores
- c) Interphase, centromeres
- ☒ d) Anaphase, kinetochores
- e) Metaphase, telomeres

✓ **Q35** Apoptosis is directly related to:

- a) asexual reproduction in *S. pombe*
  - b) the immortalization of myeloma cells
  - c) fixation of cells for transmission electron microscopy
  - ☒ d) programmed cell death
  - e) differential interference contrast microscopy
- 