Study Guide for Lect 24-25 (cell surface receptor mediated signaling)

Reading: Chapter 15.1-6
Analytic questions 3, 5, 12, 13, 15,17, 21, 23

Concepts:
1. Understand the design of a typical signal transduction pathway (the signals, receptors, switches, second messengers, adaptors, and devices for divergence).
   You might want start with cAMP-GPCR and MAPK-RTK pathways. How does a switch get switched on and off, by itself or a transacting factor? Is there a second messenger, protein-protein interaction, or modification involved in the switch? Explain the fact that all adaptors contain protein-interacting domain such as SH2 and yet not all SH2 containing proteins are adaptors. (Compare Grb2 with PLC-γ).
2. Understand the biology behind the pathways. What are the ultimate targets of a given pathway? How do such targets determine the physiological and/or biological response? What types of mutation in a signal transduction pathway would be detrimental to an organism, in the cases of cancer (and diabetes)?
3. Understand convergence among pathways by looking into specific examples. Such as EGF and Src/FAK pathways, and PLCβ vs. PLCγ (what is the difference between the two)
4. Use GPCR as an example to understand signal amplification and desensitization.

Terms
endocrine, paracrine and autocrine signaling
adaptor and scaffolding protein
Epinephrine and adrenaline
GPCRs
trimeric G protein
Gsα, Gβ, Gγ, Giα.
cAMP and adenylyl cyclase
PKA Regulatory and kinase (catalytic) subunit
Phosphorylase, Phosphorylase kinase, and glycogen synthetase
CRE (cAMP response element (transcription control sequence) and CREB (CRE binding protein)
cholera toxin: (addition of ADP-ribose)
GRK (G protein coupled receptor kinase)
Arrestin
PLC β, γ.
inositol phospholipid
PIP2
IP3 and DAG
Calmodulin and CaM kinase
PIP3
PKC
PI3K and PKB (Akt, PH domain containing kinase)
RTK
dimerization and autophosphorylation
Ras and ras^D (Ras: Rous Sarcoma Virus oncogene)
GEF and GAP
Grb2 (growth factor receptor binding protein 2)
SH2 and SH3 domain
Sos (son of seven-less, mutant of this gene cause missing #7 cell in a 8 photoreceptor cell unit of the compound eye in fly, where this gene was first found)
FGF
EGF
PDGF
insulin receptor and IRS (insulin receptor substrate)
Raf (also known as MAPKKK, for MAPK kinase)
MEK (also known as dual specificity kinase and MAPKK, for MAPK kinase)
MAPK (mitogen activated protein kinase)
Elk1
SRE and SRF (serum response element and serum response element binding factor)
c-Jun/c-Fos, AP1
focal adhesion
Integrin, Src and FAK
Apoptosis
caspase and procaspase
Bcl2 family of proteins (proapoptotic vs. antiapoptotic members, Bcl2, Bad, Bax)
internal vs. external signals
TNF and TNF receptor
death domain
cytochrome C and mitochondria
NGF pathway