



KENYATTA UNIVERSITY
UNIVERSITY EXAMINATIONS 2011/2012
SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF
SCIENCE
SBC 411: BIOCHEMISTRY OF TUMORS

DATE: Thursday 5th April, 2012

TIME: 2.00 p.m. – 4.00 p.m.

SECTION A: Answer all Questions (20 Marks each)

1. Which factors directly disrupt the proliferation of viruses?
 - a) RNase
 - b) Interferous
 - c) Tumor necrosis factor
 - d) Poly-A synthetases

2. The active CDK-2 (CDK-cyclin a complex phosphorylates nuclear proteins and microtubule-associated proteins, this causes
 - a) The chromosomes to detach from nuclear membrane
 - b) The nuclear membrane to fragment
 - c) The solenoid DNA to condense to matrix proteins
 - d) None of the above

3. What happens to the CDK-cyclin A complex at metaphase
 - a) Nothing
 - b) Only CDK is degraded
 - c) Only cyclin A is degraded
 - d) Both cyclin A and CDK are degraded

4. Into which of the following categories do the tumour suppressor fit
 - a) Inhibitors of G-proteins
 - b) Surface receptors that inhibit signal transduction pathways
 - c) Protein that sequester and consequently inhibit transcriptional activator
 - d) None of the above

5. What is an example of GTP-activating protein (GAP) do?
 - a) Inhibits Ras

- b) Stimulates Ras
- c) Inhibits trimeric G-proteins
- d) Stimulates trimeric G-protein

6. The S-phase of the cell cycle is characterized by

- a) DNA replication
- b) RNA replication
- c) Cytokinesis
- d) Growth arrest

7. Retrovirus enter cells by

- a) Injection of their RNA
- b) Endocytosis
- c) Exocytosis
- d) Membrane fusion

8. What is the enzyme called that retroviruses carry to convert their RNA genome into DNA genome.

- a) RNA-dependent RNA-polymerase
- b) DNA-dependent DNA-polymerase
- c) Reverse transcriptase
- d) None of the above

9. Which viral enzyme activity is in the core of retroviruses?

- a) Reverse transcriptase
- b) Protease
- c) RNase-H
- d) All of the above

10. Which RNA virus carries oncogenes

- a) Hepatis B virus
- b) Epstein-Barr virus

- c) Human papilloma virus
- d) Rous sarcoma virus

11. The entry into mitosis is accompanied by the phosphorylation of histone H1, chromosome protein and nuclear lamins. The protein kinase responsible for these phosphorylations is known to be regulated by the following except.

- a) Binding of a regulatory cyclin
- b) Activating phosphorylations
- c) The reversible binding of a GTP molecule to a regulatory site
- d) Protein phosphates

12. Mutations in the P53 gene are the most common observations in spontaneous human cancers. The normal P53 protein participate in normal cell cycle regulation by

- a) Inducing cell cycle arrest and apoptosis in response to DNA damage.
- b) Inducing phosphorylation of Rb protein in response to notrogens.
- c) Directly inhibiting CDK inhibitors in response to cell-cell contact inhibition
- d) Increasing the activity of cyclin-dependent kinase by inducing their phosphorylation

13. The first event in signal transduction by platelet-derived growth factor receptor is

- a) Opening the calcium channel in the plasma membrane
- b) Opening the calcium channel in the ER membrane
- c) The autophorylation of the receptor on tyrosine side chains
- d) Activation of heterotrimeric G-protein

14. Growth factor act by a mechanism different from that of classical hormones. This is referred to as.

- a) Endocrine signal
- b) Exocrine signaling
- c) Neurocrine signaling

d) Paracrine or autocrine signaling.

15. The retinoblastoma protein (RB) is a major control element of the cell cycle.

Rb becomes

- a) Transcriptionally induced at the G1 checkpoint
- b) Dephosphorylated at the G1 checkpoint
- c) Phosphorylated at the G1 checkpoint
- d) Phosphorylated at the G2 checkpoint

16. Most of the cyclins are induced and repressed periodically during the cell cycle. One cyclin however is controlled primarily by mitogens rather than by the cell cycle machinery. This mitogen-sensing cyclin is

- a) Cyclin A
- b) Cyclin B
- c) Cyclin C
- d) Cyclin D

17. The homozygous loss of a cell cycle regulator or signaling molecule may contribute to malignant transformation. This is most likely for heterozygous loss of

- a) The CDK 4 protein kinase
- b) Cyclin E
- c) A MAP kinase
- d) The CDK inhibitor INK 4

18. Some strains of human papilloma virus contribute to transformation by producing an oncoprotein product that

- a) Induce the transcription of early response genes
- b) Bind and inactivate Rb and P53 proteins
- c) Activate growth factor receptor in the absence of normal ligand
- d) Activate cyclin-dependent kinase by direct binding to the catalytic subunit.

19. An activity mutation in the ras gene most likely will:

- a) Prevent the autophosphorylation of growth factor receptors
- b) Inhibit the release of calcium from the endoplasmic reticulum
- c) Increase the activity of the MAP kinases
- d) Activate the SRC protein kinase

20. Which type of structural or functional change would be most likely in an oncogenically activated variant of the Ras protein

- a) Inability to interact with the Raf-1 protein kinase
- b) Reduced GTPase activity
- c) A point mutation in a transmembrane helix
- d) Enhanced GTPase activity

SECTION B: Answer all questions (5 Marks each)

Fill in the missing information,

1. Once i)----- has been triggered at an initial ii)-----, the stage is set for cancer cells to spread throughout the body. This ability to iii)----- is based on two distinct mechanisms namely iv)----- and v)----- . Invasion refers to direct migration and penetration of vi)----- into neighbouring tissue whereas metastasis involves the ability of vii)----- to enter the bloodstream and travel to distant sites where they form secondary tumors called viii) ----- and are not physically connected to the ix)----- . Ability of a tumor to ix)----- depend on a complex chain of events beginning with x)----- .
2. What is the difference between oncogenes and proto-oncogenes? Name the 7 major categories of oncogenes.

3. In the table given below, fill in the gaps

	Tumor Suppressor Gene	Inherited Cancer syndrome
(i)	APC	
(ii)	BRCA-1	
(iii)	BRCA-2	
(iv)	SMAD-4	
(v)	NF-1	
(vi)	NF-2	
(vii)	CDKN-2A	
(viii)	P53	
(ix)	RB	
(x)	HL-1	
(xi)	WT-1	

4. Triggering of i)----- in the absence of proper anchorage is one of the ii)----- that prevent normal cells from successfully floating away and setting up housekeeping in another tissue. Because iii)----- cells iv) -----they circumvent this safeguard. Another property that distinguishes v)----- from normal ones is their response to vi)----- conditions in culture. When normal cells are grown in a dish, they divide until the vii)-----of the dish is covered by a viii) ----- of cells. As this stage is reached, ix)----- stops. This phenomenon is called x) ----- of growth.

5. Many tyrosine receptor kinases (RTKs) trigger a chain of i)----- events inside cells that ultimately lead to ii)-----iii)----- or iv)----- . These processes are tightly controlled so that only specific cells respond when the appropriate v)----- is available. Examples of RTKs include vi)----- and other vii)-----receptors. RTKs differ structurally

from G-protein coupled receptors (GPCR) in several ways. These receptors often consist of a single polypeptide chain with only one ^{viii})-----
The extracellular portion of ix)----- contains the x) -----
----- binding domain.

SECTION C: Answer any TWO questions (10 Marks each)

1. Explain the procedure of Ames's test used in carcinogenetic testing.
2. Summarize how abnormalities in signaling pathways, cell cycle control and apoptosis contribute to tumor growth.
3. Explain the relationship between telomere length and immortalization of cancer cells.

