1. **Which of the following is a nuclear receptor?**

[ ] PD-1 receptor

[ ] endothelial growth factor receptor (VGFR)

[ ] epidermal growth factor receptor (EGFR)

[ ] estrogen receptor

[ ] None of them

1. **What is the mechanism of activation of signal transduction pathways by the cytoplasmic part of receptors with tyrosine kinase activity?**

[ ] The binding of the ligand to the extracellular part of the receptor allows interaction with other cell receptors, favoring the activation of multiple signal transduction pathways

[ ] The binding of the ligand to the extracellular part of the receptor activates the entry of calcium ions through the calcium channels, resulting in activation of signal transduction pathways

[ ] The binding of the ligand to the extracellular part of the receptor induces the excision of the intracellular segments, which then activate signal transduction pathways

[ ] The binding of the ligand to the extracellular part of the receptor activates the dimerization of receptors and the inter-activation of their cytoplasmic segments by phosphorylation. which then activate signal switching pathways

[ ] binding of the ligand to the extracellular part of the receptor allows phosphorylation of the intracellular segment by protein kinase A, resulting in activation of signal transduction pathways

1. **Regarding breast cancer patients**

[ ] There is overexpression of the membrane receptor HER-2 in percentage of

over 50%

[ ] the membrane receptor HER-2 is activated by specific

ligands implicated in the pathogenesis of breast cancer

[ ] Pertuzumab is a monoclonal antibody that targets the extracellular

portion of the HER-2 receptor

[ ] Trastuzumab is a small molecular inhibitor that targets

intracellular portion of the HER-2 receptor

[ ] Cetuximab is a monoclonal antibody that targets the extracellular

portion of the HER-2 receptor

1. **A 50-year-old man, a chronic smoker, comes to the outpatient clinic of the Hospital with hemoptysis. The imaging showed a suspicious lesion of 2 cm in the portal of the right lung and possible liver metastases. This is followed by bronchoscopy and material collection. Histological examination showed moderately differentiated lung adenocarcinoma. Which of the following is correct?**

**[ ]** The development of metastases is due to the process of angiogenesis and is not a feature of cancer cells

**[ ]**  increased cell proliferation of cancer cells is largely due to increased expression of epidermal growth factor receptor (EGFR) and activation of the MAP kinase pathway

**[ ]** Human papillomavirus (HPV) is one of the main causes of lung cancer development

[ ] B-Raf protein is the first protein to be activated in the MAP kinase pathway

**[ ]**  Disorders in a tumor suppressor gene are responsible each time for the malignant transformation of cells

1. **The signal transduction mechanism also known as protein phosphorylation**

[ ] The signaling molecule (ligand) binds to a membrane receptor

[ ] Membrane receptors with tyrosine kinase activity have an important role in inducing signal transduction intracellularly

[ ] Phosphorylated proteins themselves function as enzymes that induce signal transduction intracellular

[ ] Membrane receptors after binding the signaling molecule (ligand) self-phosphorylated

[ ] all of the above is correct

1. **A) Receptor dimerization, B) Auto-phosphorylation activating tyrosine kinases, C) Hormone/ligand binding to the extracellular part, D) Changes involving tyrosine kinases nearby, E) Activation of signaling pathways. Which of the following is the correct sequence of events for tyrosine kinase receptors?**

[ ] C, A, B, D, E

[ ] C, A, D, B, E

[ ] D, A, B, E, C

[ ] E, C, A, D, B

[ ] B, D, E, A, C

1. **Retinoic acid fetopathy is a serious genetic disorder caused by drugs taken for acne during pregnancy. Retinoic acid interacts with nuclear receptors after penetrating the cell membrane. What region of the nuclear receptor will interact with to influence the transcription of target genes?**

[ ] Dimerization domain

[ ] Transcription activation domain

[ ] Ligand binding domain

[ ] DNA binding domain

[ ] Chaperone binding domain

1. **Cancer cells have all of the following properties except**

[ ] Cell immortality

[ ] Unregulated cell division

[ ] Loss of response to anti-developmental stimuli

[ ] Induction of apoptosis

[ ] New angiogenesis capacity

1. **Which of the following answers is wrong regarding the epidermal growth factor receptor (EGFR)?**

[ ] is activated after connecting special ligands

[ ] carries an intracellular part with tyrosine kinase activity

[ ] does not form dimers with other members of the ERBB receptor family

[ ] catabolized by lysosomes after endocytosis

[ ] Its activation leads to phosphorylation of underlying molecular pathways in the cytoplasm

1. **Regarding membrane cell signaling receptors**

[ ] there is no cross-interaction between receptors

 different groups

[ ] They all have an intracellular segment with tyrosine kinase activity

[ ] their activation leads to amplification of the signal by

 Activation of underlying proteins

[ ] the main mechanism for terminating their signalling

 is their phosphorylation

[ ] There is only one ligand for each receptor