**UNIVERSITY OF OSLO**

**Faculty of Mathematics and Natural Sciences**

**Exam in: MBV4160/ MBV9160 Advanced Cancer Biology**

**Day of exam: Thursday June 6 2011**

**Exam hours: 12.00 – 15.00**

**This examination paper consists of 2 pages**

**Appendices: None**

**Permitted materials: None**

**A maximum score of 66 points can be made in this written exam. With the exception of module IV which will be awarded six points, all modules (I to III and V to VII) will be weighted equally (10 points).**

*Make sure that your copy of this examination paper is complete before answering*

**I Tumor suppressor genes in general:**

1) What is a tumor suppressor gene?

2) Explain in brief Knudsons two hit hypothesis

3) List known mechanisms by which tumor suppressor genes can be inactivated

**II TP53 “the guardian of the genome” and cell cycle**

4) Explain in brief how a single mutation in the tumor suppressor gene TP53 can have a dominant negative effect

5) Explain in detail the role of the posttranslational modification ubiquitylation in the regulation of TP53 in normal unstressed cells and in response to DNA damage

**III Colorectal cancer**

6) What types of colorectal polyps are included in the serrated neoplasia pathway? And what do these polyps have in common?

7) What is the genetic cause of the hereditary non-polyposis colorectal cancer syndrome (also called Lynch syndrome)?

8) What type of DNA sequences is prone for mutations if the mismatch repair system is defect? How can such mutations indirectly cause cancer?

**IV High-throughput sequencing**

9) What is high-throughput sequencing (also called next generation or deep-sequencing)?

10) Give a brief summary of at least four applications for high-throughput sequencing and comment on the major challenges with this technology

**V Cancer cell lines**

11) Explain in brief the difference(s) between primary cell culture and an established cancer cell line like *e.g* HeLa.

12) By which methods can cultured cells be made immortal?

13) Explain in brief the difference between immortal cancer cell lines and stem cells

**VI The rationale treatment of cancer**

14) Cetuximab is an EGFR inhibitor used to treat a subgroup of patients with colorectal cancer. Which patients are most likely to benefit from this treatment and why?

15) Gleevec (also called imatinib mesylate) is one of the success stories in cancer drug development. What is the target of the drug? Which patients will benefit from this treatment?

**VII CpG Island methylator phenotype (CIMP)**

16) The existence of CIMP was challenged for several years, why did the Weisenberger et al article in Nature Genetics in 2006 put an end to the discussion?

17) The resulting CIMP panel from the article was only based on Type C markers. What is the difference between these and Type A markers?