

Study Guide — MI Unit 3: How to Conquer Cancer (Pretest)

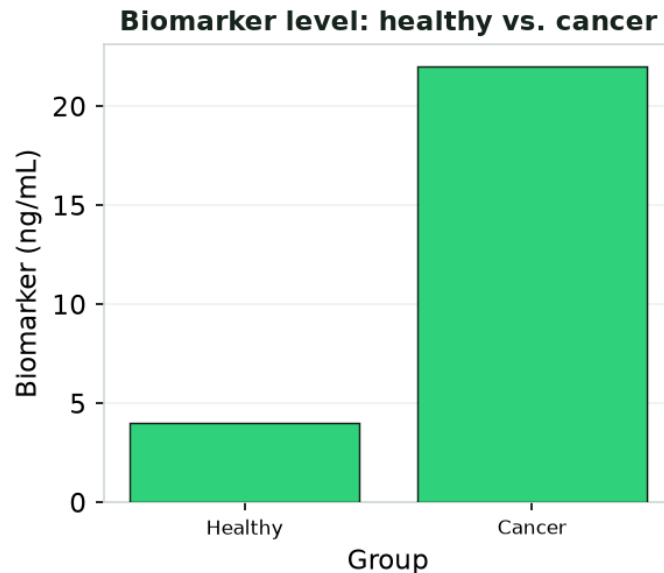
Medical Interventions (Genetics of Disease) · Unit 3 — How to Conquer Cancer · Modeled on the PLTW Guided Review format

Vocabulary to know cold

Term	Definition
Cancer	A disease of uncontrolled cell division caused by mutations in genes that regulate the cell cycle.
Cell cycle	The ordered sequence (G1, S, G2, M) a cell goes through to grow and divide.
Checkpoint	A control point that pauses the cell cycle to verify conditions (e.g., DNA is undamaged) before continuing.
Oncogene	A mutated or overactive gene (from a normal proto-oncogene) that drives a cell to divide too much.
Tumor suppressor gene	A gene that normally restrains division, repairs DNA, or triggers apoptosis; losing its function allows cancer.
Metastasis	The spread of cancer cells from the original tumor to distant body sites.
Angiogenesis	Formation of new blood vessels; tumors trigger it to obtain oxygen and nutrients.
Biomarker	A measurable molecule (often in blood) whose level can indicate the presence or progress of disease.
Imaging modality	A method (MRI, CT, PET, ultrasound, X-ray) used to see structures inside the body, including tumors.
Chemotherapy	Drugs that kill or stop rapidly dividing cells, including many cancer cells.
Targeted therapy	Treatment aimed at a specific molecule or mutation in cancer cells, often sparing more normal cells.
Control group	The comparison group in an experiment (placebo or standard care) used to judge whether a treatment caused

Worked examples (follow the reasoning)

Example 1. A blood test measures a tumor biomarker. Healthy volunteers average 4 ng/mL; cancer patients average 22 ng/mL. Using the bar graph, decide whether this biomarker could help detect cancer and explain why.



- Read the two bars: healthy $\approx$ 4 ng/mL, cancer $\approx$ 22 ng/mL.
- Compare them: the cancer level is about 5 $\times$ higher.
- A large, consistent difference means the biomarker separates the two groups.
- If it reliably separates groups, it could be used as a screening or monitoring test.

Answer: Yes — the biomarker is much higher in cancer patients, so it could help detect or monitor the disease.

Example 2. A normal proto-oncogene tells a cell when to divide. Explain, step by step, how a mutation in this gene can contribute to cancer.

- A proto-oncogene normally signals controlled, occasional division.
- A mutation can make the gene overactive or 'stuck on' — now an oncogene.
- The cell receives a constant 'divide' signal even when it should rest.
- Combined with loss of tumor-suppressor braking, the cell divides uncontrollably, forming a tumor.

Answer: A gain-of-function mutation turns a proto-oncogene into an oncogene that constantly signals division, driving uncontrolled growth.

Practice questions (with reasoning)

1. Which gene type, when it **LOSES** function, removes a 'brake' on cell division?

- A. Oncogene
- B. Tumor suppressor gene
- C. Antibody gene
- D. Ribosomal gene

Answer: B. Tumor suppressors normally restrain division; losing their function removes the brake.

2. A tumor secretes signals that grow new blood vessels toward itself. This process is:

- A. Metastasis
- B. Angiogenesis
- C. Translation
- D. Apoptosis

Answer: B. Angiogenesis is new blood-vessel formation that supplies the tumor.

3. Why does a cancer drug trial include a control group?

- A.** To give everyone the drug
- B.** To provide a baseline so the drug's effect can be separated from chance
- C.** To skip data collection
- D.** To guarantee a cure

Answer: B. The control is the comparison that lets researchers attribute effects to the treatment.