Study Guide — MI Unit 4: When Organs Fail (Mid-Unit Test)

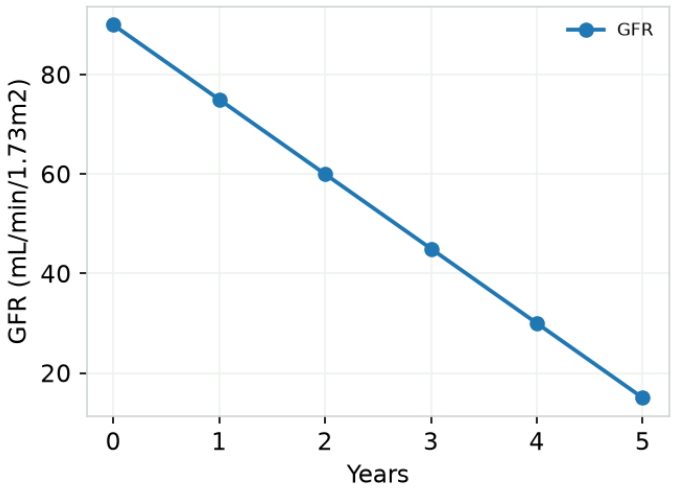
Medical Interventions (Genetics of Disease) · Unit 4 — When Organs Fail · Modeled on the PLTW Guided Review format

Vocabulary to know cold

Term	Definition
Nephron	The kidney's functional unit; site of filtration, reabsorption, secretion, and excretion.
Glomerulus	The ball of capillaries in the nephron where blood is first filtered.
Filtration	First step of urine formation: blood pressure pushes water and small solutes out of the glomerulus into the
Reabsorption	Return of useful substances (glucose, water, ions) from the filtrate back into the blood.
Glomerular filtration rate (GFR)	Volume of blood filtered per minute; the standard clinical measure of kidney function. Low GFR = poor func
Urea	A nitrogenous waste from protein breakdown that healthy kidneys excrete.
Creatinine	Muscle-metabolism waste cleared by the kidney; rises in blood as function falls.
Dialysate	The controlled fluid in dialysis whose ion concentrations set the gradients that pull wastes from blood.
Dialyzer	The hemodialysis component containing the semipermeable membrane where waste diffuses out of the blo
Diffusion	Movement of solutes from higher to lower concentration; the principle behind dialysis.
Precision vs accuracy	Precision is repeatability of measurements; accuracy is closeness to the true value.
Standard operating procedure (SOP)	Written, step-by-step protocol that keeps a lab or clinical procedure consistent and safe.

Worked examples (follow the reasoning)

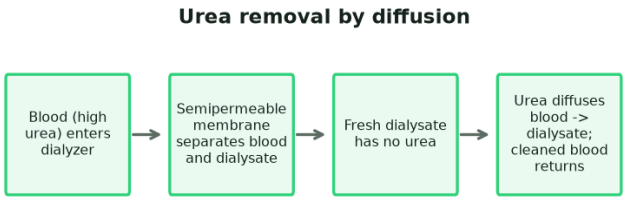
Example 1. A patient's GFR is tracked for 5 years: 90, 75, 60, 45, 30, 15 mL/min. Describe and interpret the trend.



- Read the y-values: GFR falls about 15 mL/min each year.
- A normal GFR is roughly 90+; values keep dropping below that.
- A steadily falling GFR means the kidneys are filtering less and less.
- By year 5 (GFR 15) the patient is approaching end-stage kidney failure, where dialysis or transplant is needed.

Answer: Progressive decline of kidney function (chronic kidney disease) reaching the end-stage range that requires dialysis or transplant.

Example 2. Explain step by step how diffusion removes urea from a patient's blood during hemodialysis.



- Blood entering the dialyzer has a high urea concentration.
- Fresh dialysate on the other side of the membrane has essentially no urea.
- A concentration gradient exists across the semipermeable membrane.
- Urea diffuses down the gradient from blood into dialysate; the used dialysate is discarded and cleaned blood is returned.

Answer: Urea diffuses from the high-concentration blood across the membrane into the low-concentration dialysate, lowering blood urea.

Practice questions (with reasoning)

1. Finding large plasma proteins in the urine suggests damage to which step?

A. Excretion
B. Glomerular filtration barrier
C. Secretion
D. Reabsorption of glucose

Answer: B. A healthy filtration barrier keeps large proteins in the blood; their presence in urine signals barrier damage.

2. Why must hemodialysis patients limit dietary potassium?

A. The body cannot make potassium
B. Failed kidneys cannot excrete excess potassium, risking arrhythmias
C. Potassium is converted to urea
D. Dialysis adds potassium

Answer: B. Without renal excretion, potassium accumulates and can cause dangerous heart rhythms.

3. Two repeat GFR measurements of 28 and 29 mL/min on one sample best demonstrate:

A. Accuracy
B. Precision
C. Bias
D. Contamination

Answer: B. Close agreement among repeats is precision.

4. In hemodialysis, wastes leave the blood because they are:

A. Pumped in from dialysate
B. At higher concentration in blood than in dialysate
C. Positively charged
D. Heavier than water

Answer: B. Solutes diffuse down the concentration gradient from blood into fresh dialysate.