NT vs Hormones (1)

Feature	Neural	Hormonal
1) chemicals	NT	hormones
2) transport	interstial fluids (ICF) synaptic cleft	blood (ECF)
3) electrical	AP, PSP (2)	Ca+ diffusion across memb.
4) mechanism	AP - 4 phases	1) 2nd mess. 2) gene activ.

NT vs Hormones (2)

Feature	Neural	Hormonal
5) duration	ms	sec - years
6) circuit	sensory neuron ↓ CNS ↓ motor neuron ↓ effector ↓ response	prod. gland ↓ rel. gland ↓ horm. mech. ↓ target organ ↓ response

Master Glands

1) **hypothalamus**
   - **autonomic center**
   - **produces hormones that reg. other organs**
   - **releases hypothalamus & pituitary hormones**
2) **pituitary**
   - **produces hormones that reg. other organs**
   - **release of hormones reg. by hypothalamus**

3) **tight relationship bet. 2 organs**
   a) **hypothalamic-hypophyseal tract**
      - **connecting nerve bundle**
   b) **hypophyseal portal system**
      - **connecting blood vessels**

Hormone Assign. (not collected)

Hormone	Target	Normal Effects	Hyposecr. Effects	Hypersecr. Effects

2nd Mess. Hormones:

1) **pituitary: GH, TSH, ACTH, FSH, LH, PRL, ADH, oxytocin**
2) **pancreas: insulin, glucagon**
3) **adrenal med.: epinephrine & nor-epi. (combined)**
4) **parathyroid: PTH**

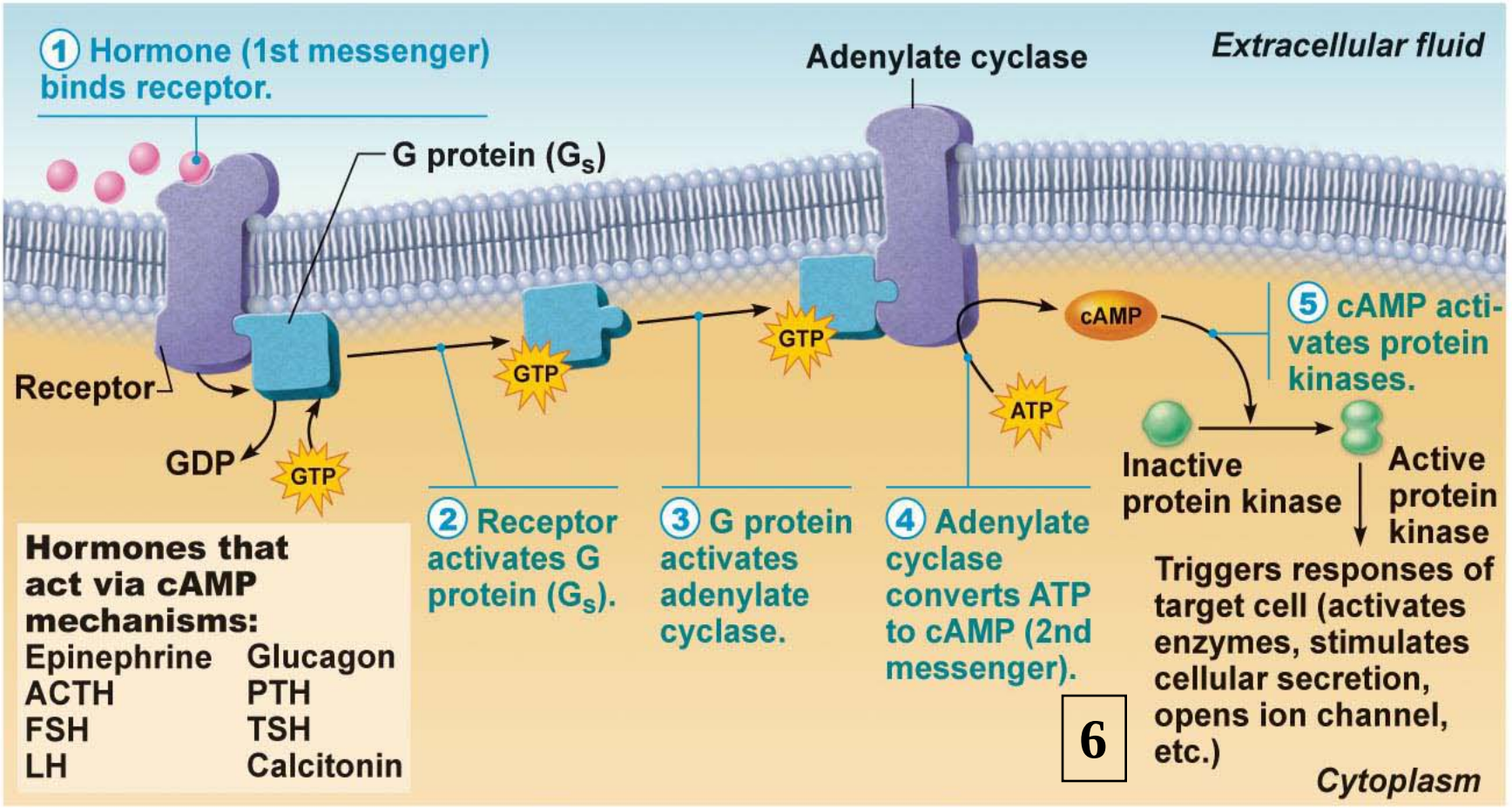
Gene Activation Hormones:

1) **adrenal cortex: aldosterone, cortisol, testosterone**
2) **gonads: estrogen, progesterone, testosterone**
3) **thyroid: T3 & T4 (combined), calcitonin**

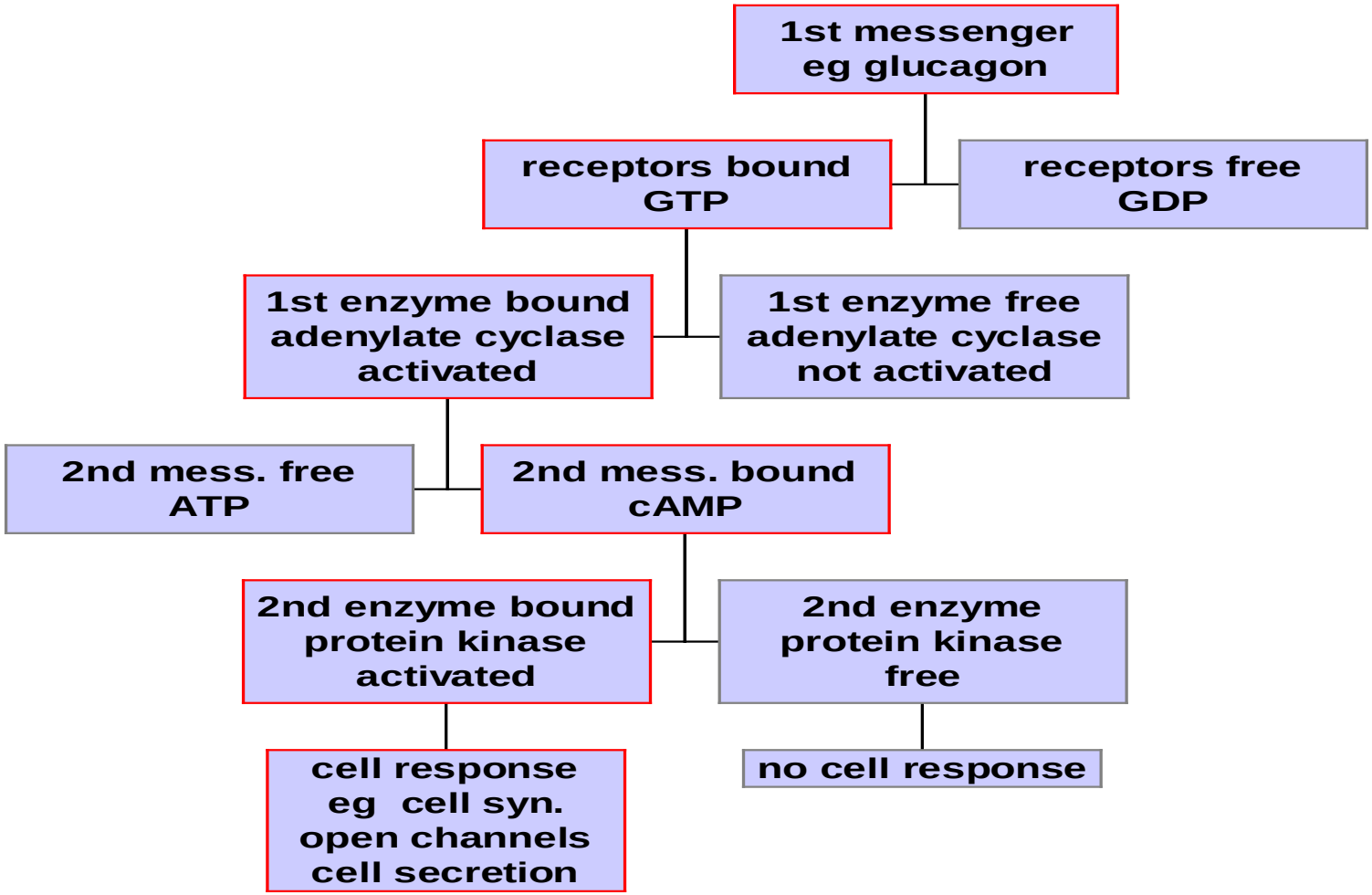
Hormone Groups

Mechanism	Hormone Group	Producing Gland
1) 2nd messenger	"amino based"	
	a) polypeptides & glycoproteins	1) pituitary 2) pancreas
	b) catecholamines	1) adrenal medulla
2) gene activation	"steroid"	
	a) steroids	1) adrenal cortex 2) gonads (ovary, testis)
	b) thyroid hormone	1) thyroid

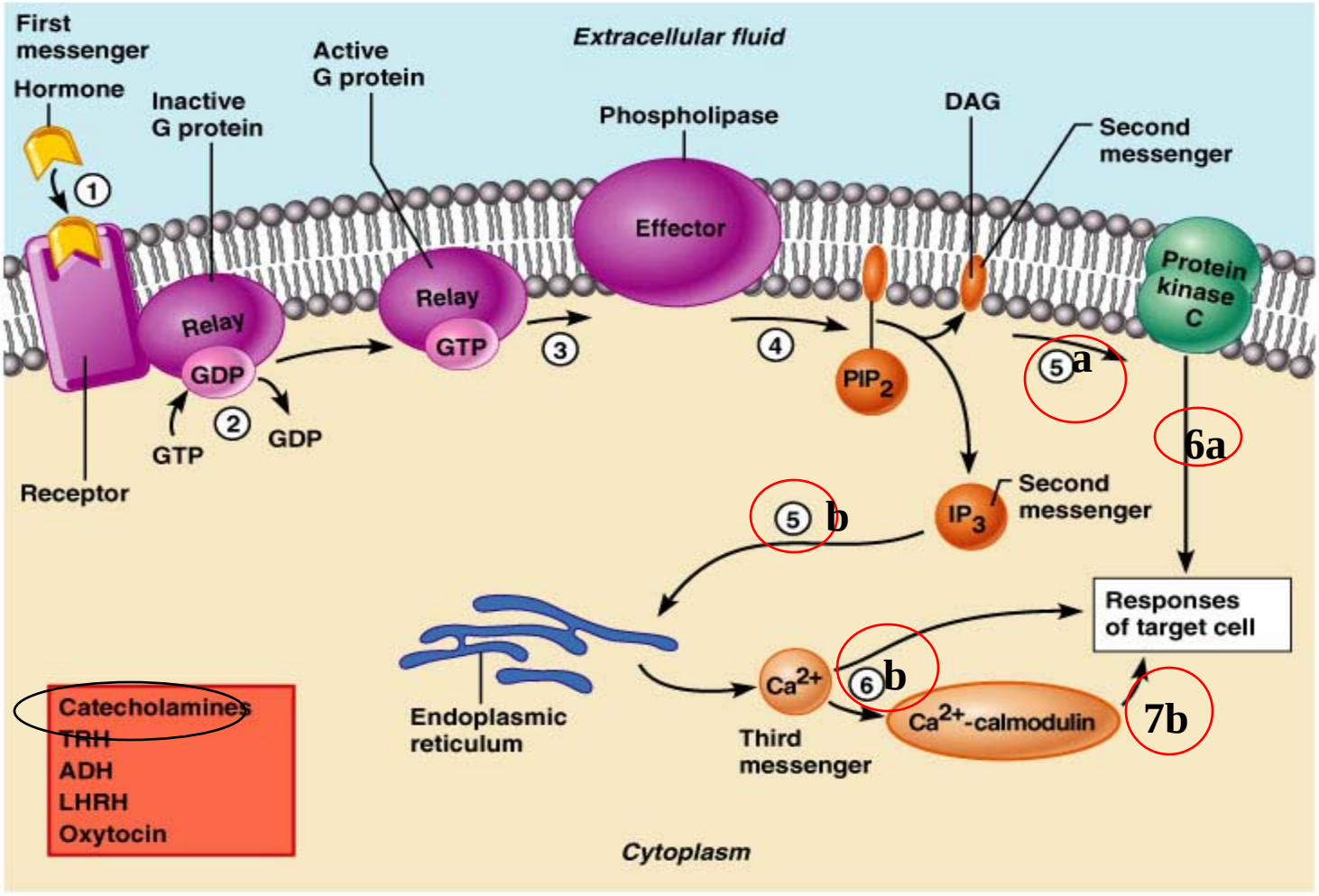
2nd Mess. (cAMP) Diagram



2nd Mess. (cAMP) Chart



2nd Mess. (Ca^{2+}) Diagram

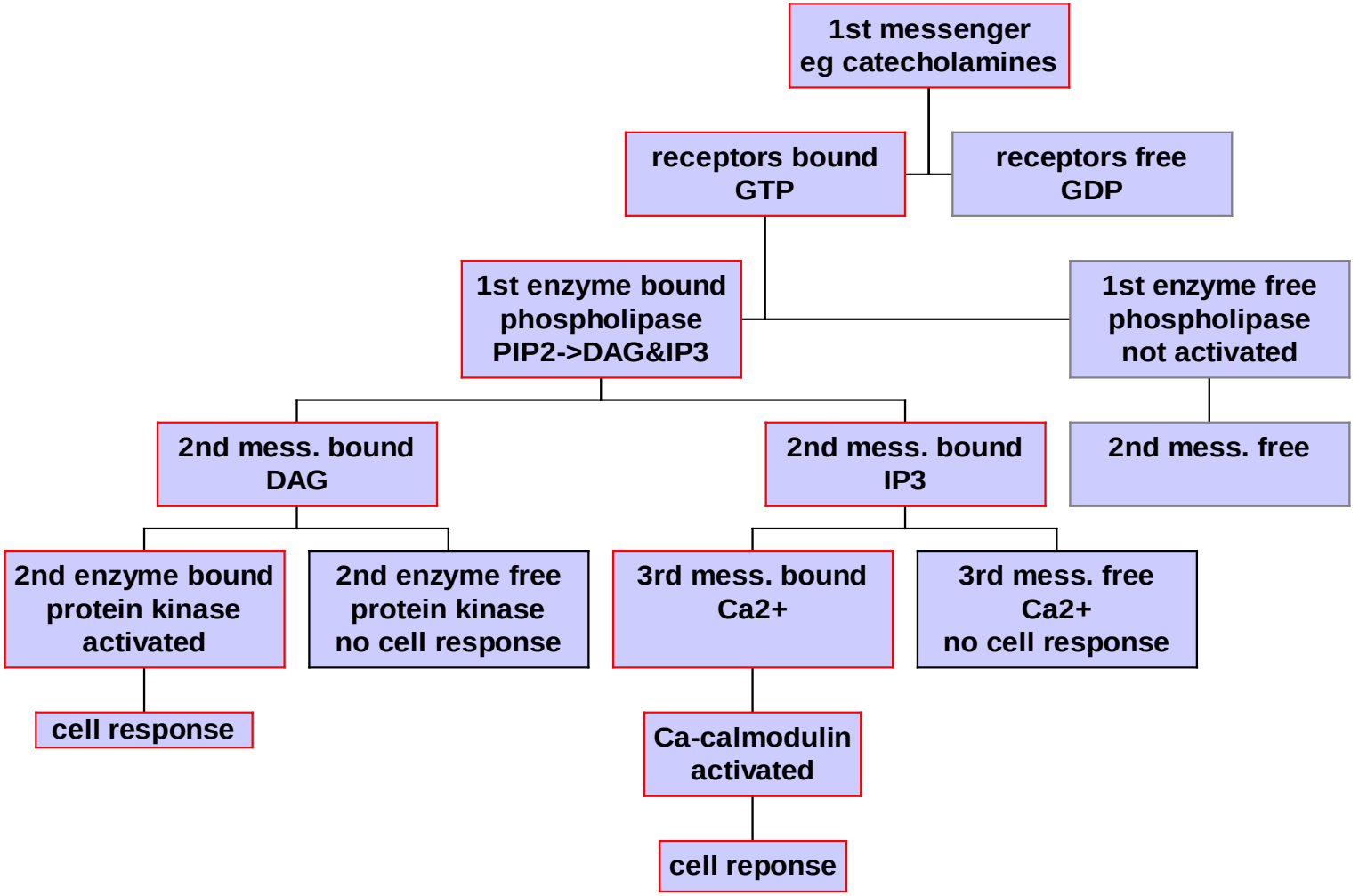


(b)

2nd Mess. (Ca^{2+}) Steps

Step	Location	Action
1.	blood	1st mess. transported
2.	memb.	receptor activated
3.	"	1st enzyme (phospholip.) (PIP_2->DAG & IP_3)
4a.	"	2nd mess. (DAG)
5a.	"	2nd enzyme (prot. kinase)
6a.	cytoplasm	cell response
4b.	cytoplasm	2nd mess. (IP_3)
5b.	"	3rd mess. (Ca^{2+})
6b.	"	Ca-calmodulin
7b.	"	cell response

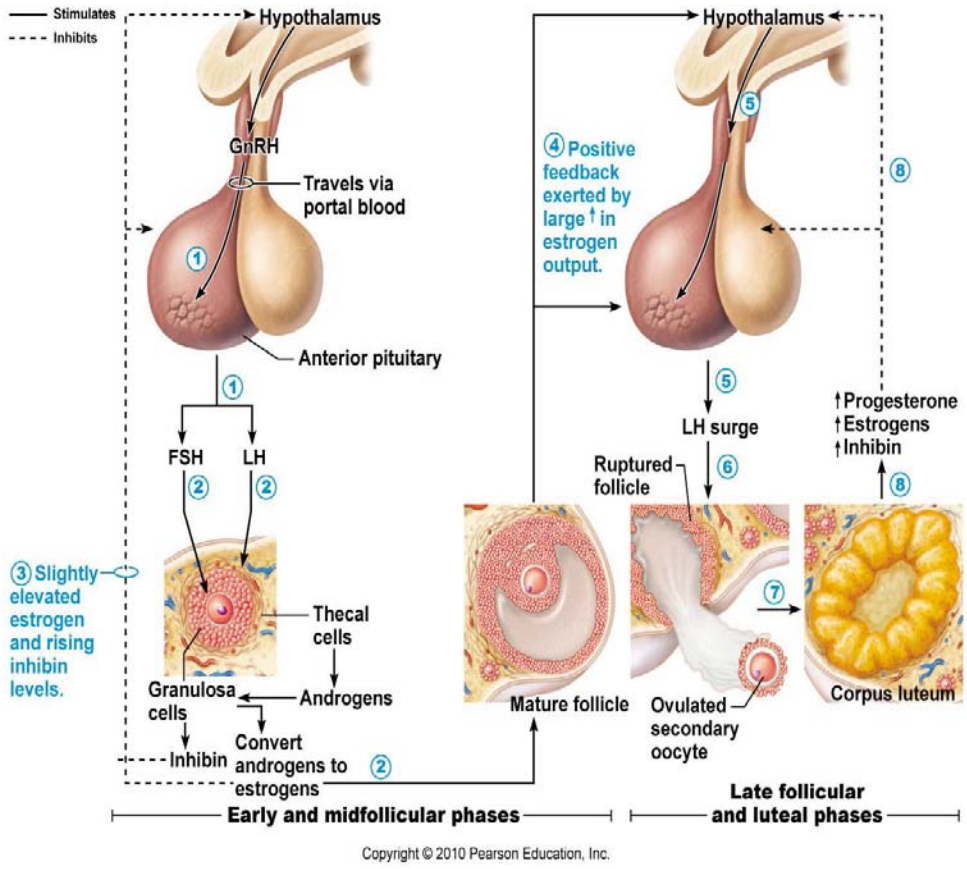
2nd Mess. (Ca^{2+}) Chart

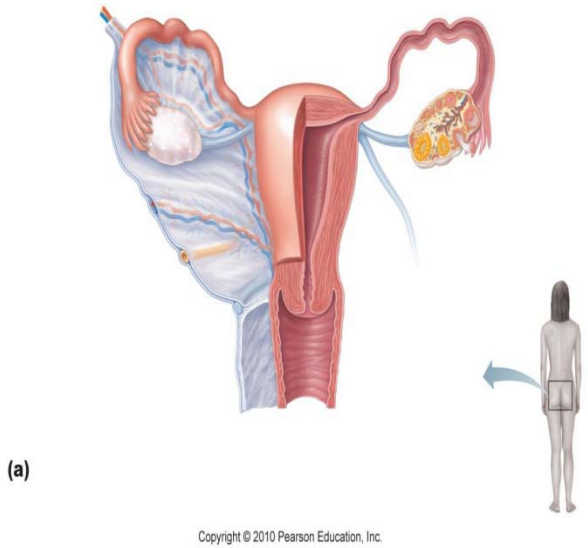


Gene Activation Steps

Step	Location	Hormonal Action
1.	blood	hormone transported
2.	cell memb.	hormone enters cell
3	cytoplasm	" complex in cytoplasm
4.	nuclear membrane	" " enters nucleus
5.	chromatin	receptor-hormone complex activates spec. gene
6.	chromatin	transcription (prod. mRNA)
7.	nuclear membrane	mRNA exits nucleus
8.	cytoplasm	translation

Pregnancy - monthly readiness

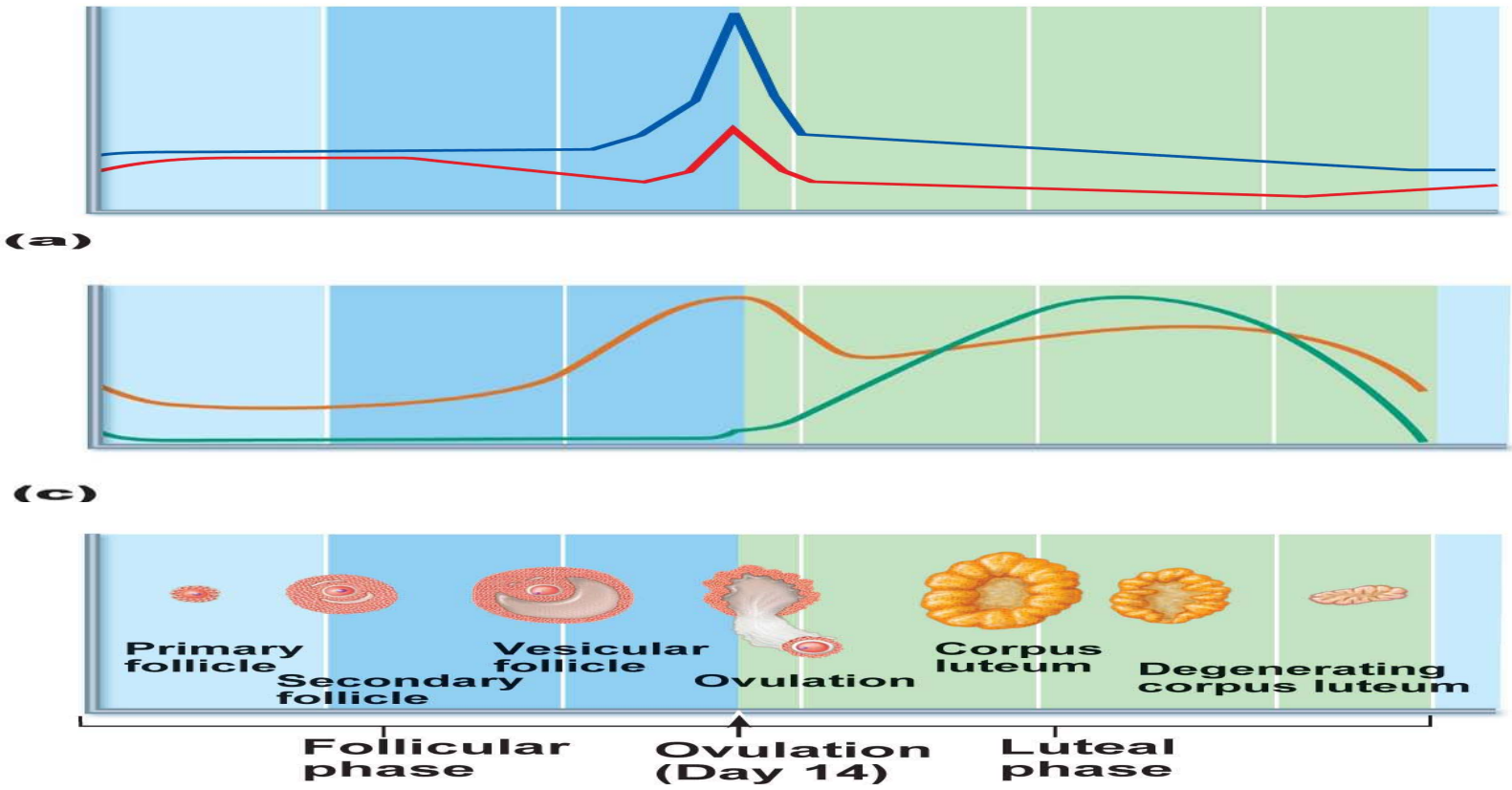




5 hormones: GnRh, FSH, LH, estrogen, inhibin

Hormonal Interaction Graphs

days: 1	14	28



LH
FSH
reg.
estrog
prog.

(b) **Ovarian cycle:** Structural changes in the ovarian follicles during the ovarian cycle are correlated with (d) changes in the endometrium of the uterus during the uterine cycle.

Daily Horm. Interactions (1)

day 1 - 13:

1) ↑ GnRH -> ↑ FSH & LH

2) ↑ FSH & LH -> stim. follicle growth & some estrogen

3) low estrogen in blood ->

- **a) inhibits GnRH, & ↓ FSH & LH release**
- **b) inhibin inhibits FSH release**
- **c) stim. follicle maturation (↑ estrogen)**

4) ↑ estrogen in blood->

- **a) stim. GnRH, FSH & LH release**
- **b) stim. follicle growth & estrogen prod. (↑ ↑ estrogen)**

5) ↑ ↑ estrogen -> ↑ ↑ GnRH, FSH & LH

Daily Horm. Interactions (2)

day 14-28:

6) ↑ ↑ LH: a) egg dev & ovulation

b) follicular damages -> ↓ estrogen

7) ↑ LH: a) follicle -> corpus luteum

b) corpus lut. -> ↑ estrogen (2nd ↑) & progesterone

8) ↑ estrogen & progesterone in blood

a) inhibits GnRH, FSH & LH release

b) inhibin inhibits FSH & LH release

c) ↓ FSH inhibit new follicle growth

d) ↓ LH degenerates corpus luteum

e) ↓ estrogen & progesterone levels

***conditions ready for day 1 again**