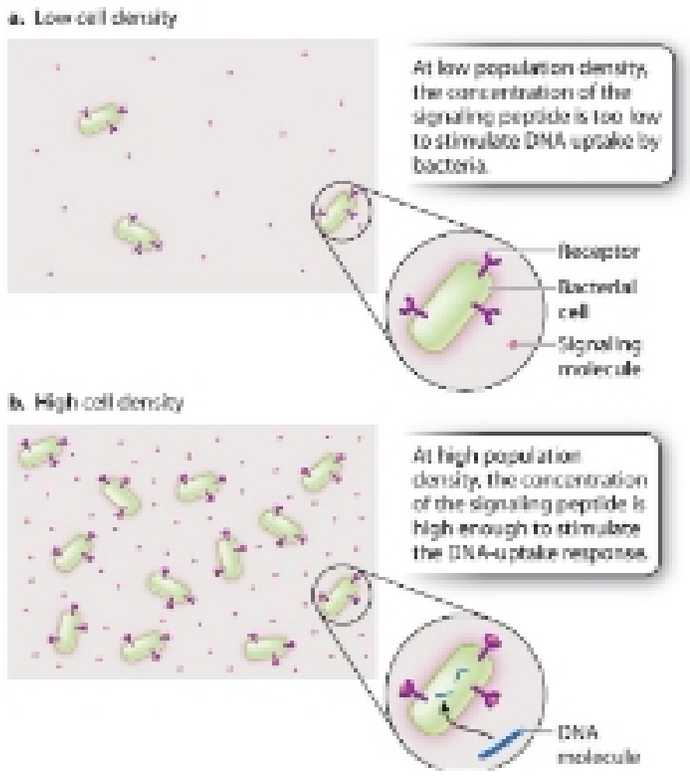
Chapter 9: Cell Communication



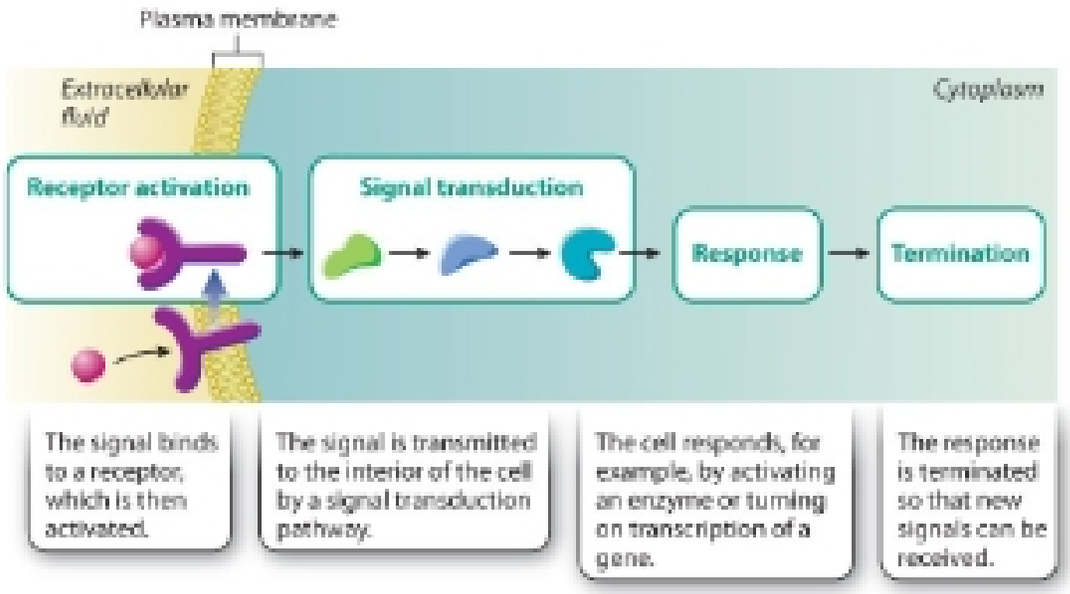
9.1:

I. *Introduction & Pupillary Reflex*

- **A. Definitions**
  1. Communication – producing, detecting, and/or responding to signals
  2. Signal – any "agent" that affects a cell
     - **a.** *Ex.* a molecule (ligand), a force, light
       - ***i.*** **Ligands bind to receptors noncovalently*
  3. Receptor: a cellular structure, usually a protein, that responds to a signal
- **B.** Unicellular organisms communicate with neighbors or the environment ***(Fig. 9.1a)***

II. *When a cell receives a signal…(Fig. 9.3)*

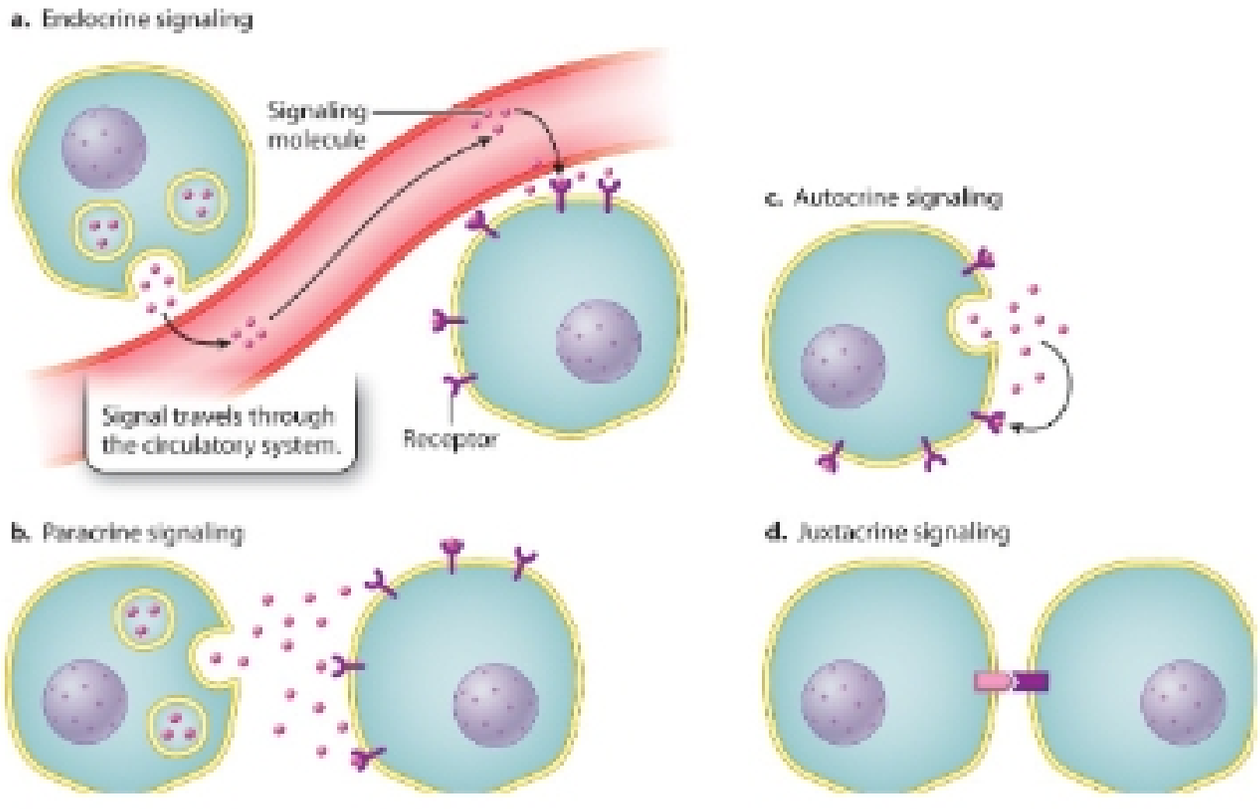
- **A. Receptor Activation**
- **B. Signal Transduction** (conversion to a different form)
- **C. Cell Response to the signal**
  1. *Ex. enzyme activation, cytoskeletal change, or transcription*
- **D. Termination of Response**



9.3

III. *Types of cell signaling (Fig. 9.4)*

- **A.** Endocrine
  1. Signals travel **long distances** through the bloodstream
  2. Signals are called **hormones**
- **B.** Paracrine signaling
  1. Signaling cell lack receptors; target cell is **local**
- **C.** Autocrine signaling
  1. Signaling cell **receives its own signal**
  2. *Ex. Looking in a mirror*
- **D.** Juxtacrine signaling
  1. Contact-dependent
  2. Cell that produces the signal must directly contact receptor cell to communicate (signal never enters extracellular space)
  3. *Ex. Development of a zygote*



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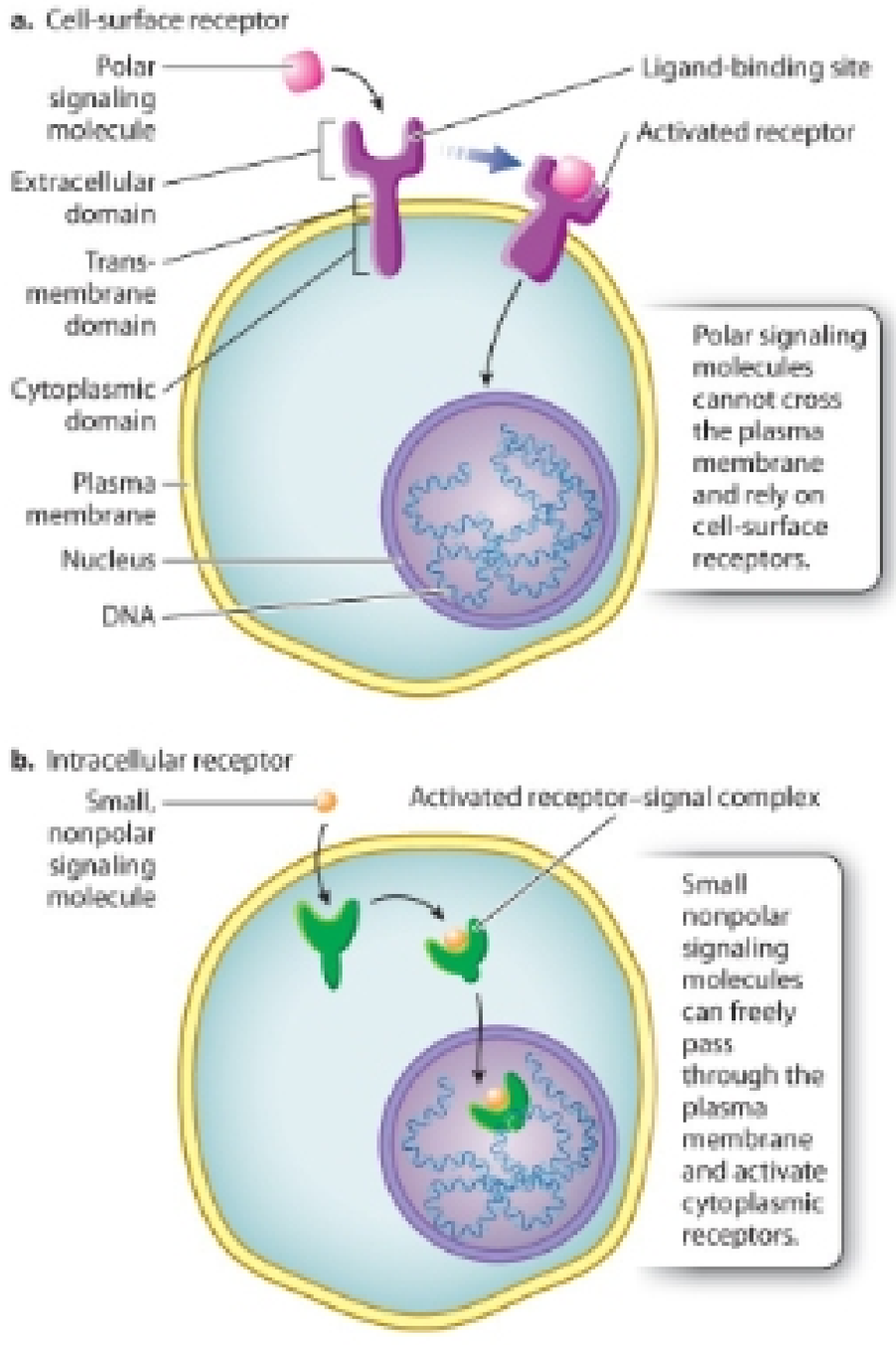
IV. *Ligand-Receptor Activity*

A. **Cell surface receptors** interact with molecules that **can't diffuse** across membrane ***(Fig. 9.6)***
B. Signals that **do diffuse** across the membrane bind to **intracellular receptors** ***(fig. 9.6b)***
C. ***Clicker question: Ligand//type of receptor (intra vs. extracellular)*
    1. ***Tryptophan****: extracellular*
    2. ***ATP****: extracellular*
    3. ***Estrogen****: intracellular (all steroids diffuse through membranes)*
    4. ***Insulin****: extracellular*
    5. ***Adrenaline****: extracellular*
D. **ATP can be released as a signaling molecule**
    1. 3 types of ATP receptors
        a. *P1, P2X, P2Y*



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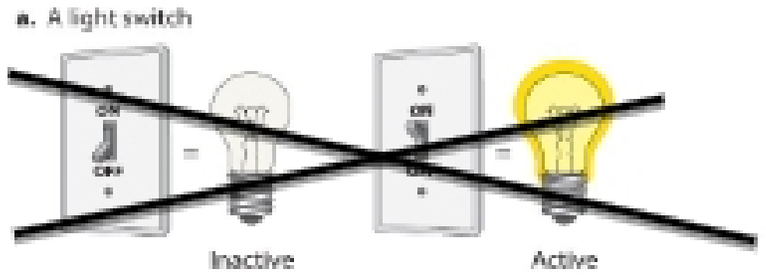
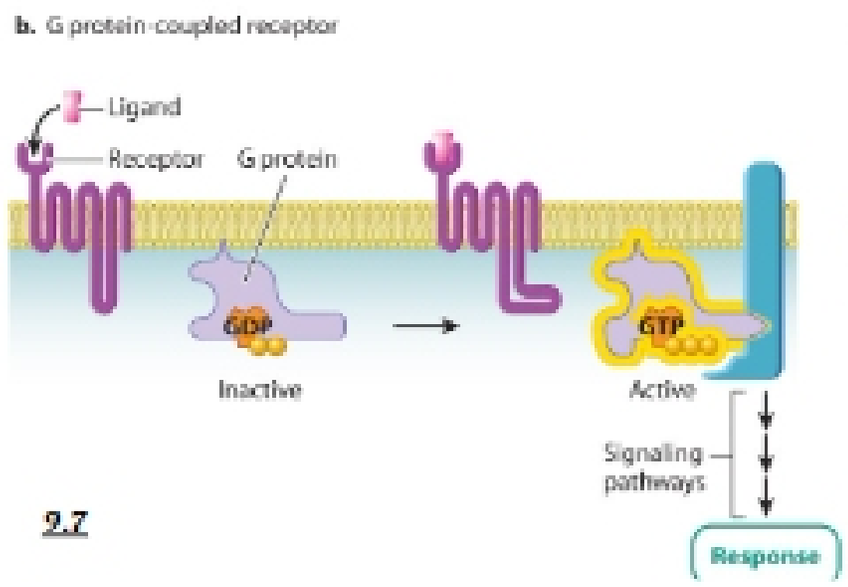
V. ***3 classes of cell surface receptors (GPCR's, Enzyme-Linked, & Ligand-Gated Ion Channels)***

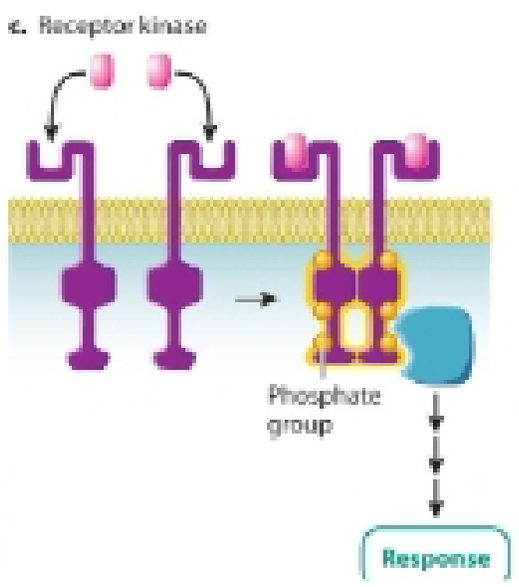
A. **G-Protein Coupled Receptors (G.P.C.R.) *(Fig. 9.7b, 9.8)***
   1. Associate with other proteins when activated
   2. **5 steps of G.P.C.R. Activation**
      1) Signal binds to G.P.C.R.
      2) G.P.C.R. changes shape & binds to G protein complex
      3) G protein releases GDP from its α-subunit
      4) GTP binds to the α-subunit, taking the place of GDP
      5) G protein complex dissociates (breaks apart) & activated α-subunit propagates response
   3. **When GTP binds to a protein, the protein changes shape**

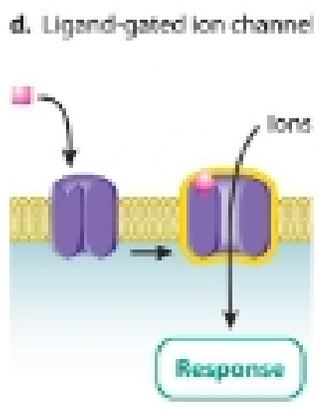
B. **Enzyme-Linked Receptors (Fig. 9.7c)**
   1. When activated, catalyze reaction
      a. Usually phosphorylate cytosolic protein
      b. ***Fig. 9.7c***: receptor proteins dimerize to form 2-part structure, then phosphorylate a target protein

C. **Ligand-Gated Ion Channels (Fig. 9.7d)**









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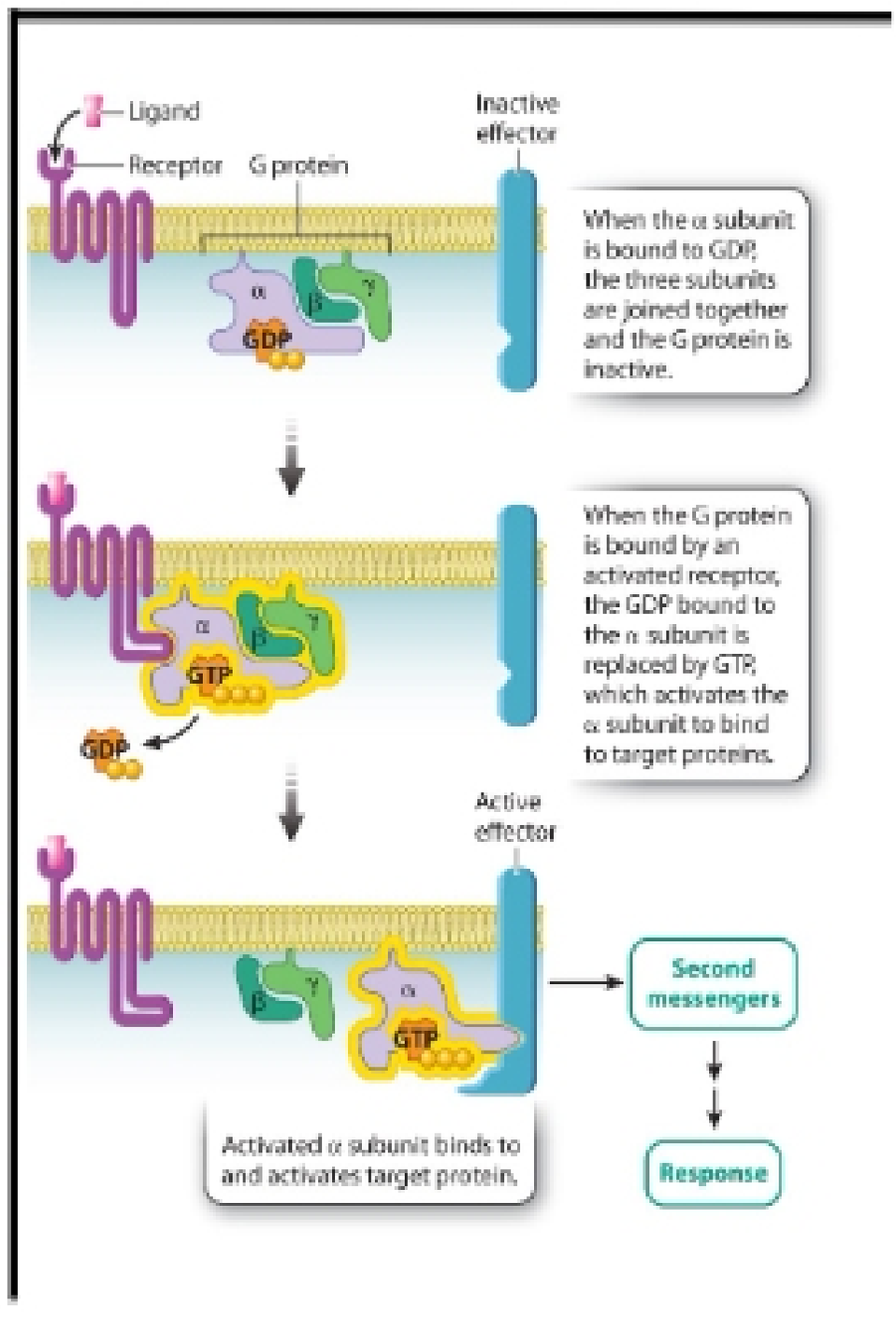

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VI. *Amplifying Signals (Secondary Messaging)*