The thyroid gland

Histology
Thyroid is surrounded by a fibrous capsule.
The thyroid is composed of follicles, composed of a central colloid pool (Rich in thyroglobulin) and lined by follicular cells (produce T3 and T4)
Inactive cells = flat to low cuboidal
Activated cells (stimulated by TSH) – become columnar
In between follicles = parafollicular cells (aka C-cells): function in production of calcitonin; usually pale staining; can form clumps; granular cytoplasm

The role of the thyroid gland in modulation of the hypothalamic-pituitary interaction
TRH from the hypothalamus affects the anterior pituitary → TSH released into circulation and reaches the thyroid gland → TSH docks onto TSH Rs → stimulates activation and production of T3/4 (T3/4 feedback regulates TSH release by anterior pituitary)

TRH
Secreted as a larger precursor molecule; actual TSH molecule is a tripeptide, PRN and SCN
TRH causes TSH release and also prolactin secretion.
Severe hypothyroidism (lack of T3/4): No feedback inhibition of TRH → increased TRH → increased prolactin
  - If have high circulating levels of prolactin then assess thyroid status
  - If hypothyroid, treat this and prolactin levels will also return to normal

TSH
Glycoprotein hormone very similar to FSH and LH: all are glycoprotein hormones
TSH is secreted by thyrotrophs (15% of cellular components of anterior pituitary)
Homology with FSH, LH and TSH in alpha subunit.
TSH synthesis dependent on TRH from the hypothalamus- TRH interacts with the GPCR and consequently get PLC and PI turnover.
  - The GPCR gives the clinical manifestations: get TSH, LH and FSH effects, but not prolactin secretion: different secondary messenger system controls the release of prolactin.

Regulating TSH secretion
TRH and TSH act on the thyroid
T4: 4 iodide molecules attached; T4 also regulates the extra-thyroid conversion sites
Peripheral conversion of T4 = removal of iodide molecules → T3
  - Some people have a mutation which affects de-iodogenase enzyme; these individuals cannot convert T4 to T3 → chronic hypothyroidism
  - Do not treat hypothyroidism by giving T4, but give T3
T3: 3 iodide molecules attached