• 1. Thyroglobulin synthesis 
• 2. Active uptake of iodides from the plasma and its concentration in the thyroid colloid (the iodide pump). 
• 3. Oxidation of iodide into elemental iodine. 
• 4. Iodination of tyrosine molecules of the thyroglobulin by iodine \(\rightarrow\) formation of monoiodotyrosine (MIT) and diiodotyrosine (DIT) 
• 5. Condensation of two molecules of DIT to form \(T_4\), or one molecule of D1T and one molecule of MIT to form \(T_3\).
Transport of thyroid hormones

• The normal level of total T₄ in plasma is 8µg/dL, for T₃ it is 0.15 µg/dL.
• Only 0.02% of T₄ and 0.2% of T₃ are free, the remaining portions are bound to plasma albumin, thyroid-binding prealbumin (TBPA) and thyroid-binding globulin (TBG).
• Most of the circulating T₃ is derived from deiodination of T₄ by target tissues.
• Thyroid-binding proteins increase during pregnancy, by estrogens, or tranquilizers (e.g. benzodiazepines).
• They are decrease by glucocorticoids and androgens.
• 5. Synergism with catecholamines:

• Thyroid hormones increase the number and sensitivity of β-adrenergic receptors.

• Some of the manifestations of hyperthyroidism (e.g. tachycardia, extrasystoles, sweating and tremors) can be abolished by β-adrenergic blockers.
• There are circadian and circannual rhythms of thyroid hormones secretion; their level is slightly higher in the morning and in winter.
• Cold stimulates the release of the hypothalamic TRH → release of pituitary TSH→ secretion of thyroid hormones, but the exposure to cold should be maintained for at least 4 - 5 weeks.
Control of thyroid activity during pregnancy

- During pregnancy, the placenta secretes two hormones which stimulate thyroid activity.
- These hormones are the human chorionic gonadotropin (hCG) and the human chorionic thyrotropin (hCT).
- Both hormones are found throughout pregnancy, but the hCG is found in particularly large amounts during the first trimester.
- These two hormones take over the control of thyroid activity during pregnancy and TSH secretion is markedly suppressed.
• Cutaneous vasodilatation makes the skin red and warm, and excessive sweating makes it moist.

• The heart rate and cardiac output increase which increase the systolic blood pressure.

• Peripheral vasodilatation decreases the diastolic pressure, so the pulse pressure increases.
• Hyperthyroidism is treated by antithyroid drugs or by surgical removal of the excess thyroid tissue (thyroidectomy).

• Graves’ disease and exophthalmos respond well to immunosuppressive drugs, e.g. glucocorticoids
3. Basal metabolic rate (BMR):
- It increased in hyperthyroidism and decreased in hypothyroidism.
- It is a nonspecific test but generally an easy useful indicator.

4. Serum cholesterol:
- It is high in hypothyroidism and low in hyperthyroidism.
- This is also a nonspecific test.