PERMANENT MOLARS

- They are 12 in number, 6 in each jaw (upper first, second and third lower first, second and third).
- They have larger but shorter crowns than the premolars.
- Maxillary molars have 3 roots (2 buccal, 1 palatal), Mandibular molars have 2 roots (1 buccal, 1 palatal).
- The crowns of upper molars centered over their roots, but lower molars are inclined lingually.
- The molars decrease in size as we go distally, because the distolingual cusp gradual reduction in the size, and it may be absent in the 3rd molar.
- In the lower molars: 1st is the largest one, the 3rd may be either larger or smaller than the 2nd.
- The occlusal outline of upper molars is wider buccolingually, while in the lower molars it's wider mesiodistally.

PERMANENT MAXILLARY MOLARS

Maxillary first molar
- Maxillary molars are the largest tooth in the maxillary arch.
- It has 4 cusps (4 developmental lobes) and 5th nonfunctioning cusp (tubercle), this tubercle is attached to the mesiolingual cusp and it is called cusp or tubercle of carabelli.
- It has 3 roots (2 buccal, 1 palatal) they give this tooth the maximum anchorage against forces.

Chronology
Enamel completed 3–4 yr
Eruption 6 yr
Root completed 9–10 yr
The buccal aspect

- Geometrical outline is trapezoid, with the smallest side cervically.

Outline

- Mesial outline is straight till the contact area (at the junction of occ. and middle 1/3s), then become convex till the cusp.
- Distal outline is convex till the contact area (at the middle third).
- Mesial slope of the MB cusp and distal slope of the DB cusp are convex.
- The cervical line is straight or slightly convex root wise with some irregularities.

The occlusal outline

- Occlusal show two buccal cusp, the mesiobuccal and distobuccal cusps.
- The MB cusp is broader than the DB cusp which is longer and sharper.
- The ML cusp can be seen between the two buccal cusps.
- The two buccal cusps are separated by buccal developmental groove.

Surface anatomy

- The buccal surface is convex, the maximum convexity (Cervical ridge).
- Buccal developmental groove extends to the middle of the buccal surface separates the two buccal cusps.

The roots

- Three roots, two buccal and one palatal.
- The DB root is shortest.
- There is root trunk at cervical third. It has a developmental groove.
- The palatal root is the longest one, and appears between the two buccal roots.
Lingual aspect.

- The geometrical outline and outline is similar to the buccal aspect.

Outlines

- Two lingual cusps + cusp of carrabelli,
- One lingual root (two parts of buccal root are seen)
  - Mesial outline: straight till the contact area then become convex till mesiolingual cusp tip.
  - The ML cusp is larger than the DL cusp.
  - The lingual developmental groove separates the two lingual cusps and may end in a pit.
  - The lingual groove is in line with the palatal root apex.
  - Tubercle of Carabelli present on the ML cusp.
  - The palatal root has developmental depression.
  - Cervical line is irregular.

ANATOMY:

- The lingual surface is convex, (Maximum convexity: middle 3rd).
- The lingual developmental groove separates the two lingual cusps.

-- The three roots could be seen.

The mesial aspect:

1- Geometrical outline (Trapezoid in shape with The short side occlusally.)

2- The buccal outline is convex at cervical third for the cervical ridge, Then become less concavity (slightly concave) till the occlusal (MB cusp).

3- The lingual outline is convex with the maximum convexity at the middle third, (mesiolingual cusp has the cusp of Carabelli).
4-Occlusal
- shows 2 cusp tips mesiobuccal and mesiolingual cusps .
  - ML cusp larger than MB cusp.
  - The mesial marginal ridge is continuous with two cusp.
5- The cervical line is irregular and curved occlusally.
6- Surface anatomy
- the mesial surface is flat.
- The contact area present at the junction of the occlusal and middle third and buccal to the midline.
- shallow concavity is found above a contact area & extends towards the root.
7- The roots
- Mesiobuccal and palatal roots are seen.
- the buccal outline of the mesial root is curved , but lingual outline us straight.
- The palatal root is longer but narrower than mesial root , The palatal out line is convex , the buccal out line is concave
- it's widely divergent and extending in a lingual direction.
- the root trunk is short about 3 mm.

**Distal aspect**
Similar to the mesial aspect but differs in:
1- The crown converges distally.
2- The cervical line is nearly straight
3- distal surface is generally convex , except for small concavity near the distobuccal root , at the cervical 3rd.
4- The three roots could be seen , DB is narrower than MB.
5- The root trunk is longer than the mesial ( the bifurcation is more apical ( about 5 mm)).
The occlusal aspect
- It is rhomboidal in shape.
- The mesiobuccal and distolingual angles are acute, the mesiolingual and the distobuccal angles are obtuse.
- The mesial outline is longer than the distal, the lingual outline is longer than the buccal, so there is a distobuccal convergence.
- It has 4 major cusps and one fifth minor cusp (☻ Tubercle of Carabelli present on the mesiolingual cusp. Connecting ML cusp)
- The four cusps according to the size are:
  1. The mesiolingual
  2. The mesiobuccal
  3. The distobuccal
  4. The distolingual.

Elevations:
1. Four cusps with triangular ridges.
2. M, D marginal ridges.
3. Oblique ridge (between the ML and DB. cusps).

Depressions:
1. 4 fossa, 2 major & 2 minor
   - 2 minor fossa is a triangular fossae just front to the mesial and distal MR.
   - 2 major fossa is:
     - Central fossa (triangular) mesial to the oblique ridge with central of occlusal.
     - Distal fossa (elongated) distal to the oblique ridge (cigar shaped).

2. Grooves
   - Central dev. Groov
   - Buccal dev.groove.
   - Mesiobuccal D.G.
   - Mesiolingual D.G. - Transverse G. of oblique ridge
   - Distobuccal D.G.
   - Distolinguale D.G - Lingual D.G
Permeant maxillary second molar chronology

- Enamel completed: 7-8 years.
- Eruption: 12-13 years.
- Root completed: 14-16 years.

-The difference between first and second molar:

- the second molar is shorter in all dimensions.
- there are two types of max. second molar:

  1- 4 cusp type (95%): two buccal cusp and two lingual cusp (the oplique ridge connects the lingual cusp with the DB cusp).
  2- 3 cusp type (5%): two buccal cusp and one lingual cusp (the distolingual cusp is absent).

- it's shows a lingual convergence. the root is less divergent (the flare out less).
- the occlusal outline is more rhomboidal.
- both the distal cusp are smaller in size.
- less prominent oblique ridge.
- cusp of carabelli is absent.
The Permeant Maxillary Third Molar

Chronology

- Enamel completed: 12-16 years.
- Eruption: 17-21 years.
- Root completed: 18-25 years

- The smallest molar.
- The most common crown form is heart shape; it has one lingual and two buccal cusps.
- The occlusal surface is wrinkled appearance because of the many supplemental grooves.
- It may have a typical form of the first or second molar, with smaller dimensions.
- It is no distal contact area.
- It has 3 roots like all maxillary molars, but less divergent and shorter, in most of they are fused together with a longer root trunk.
Pulp cavities of permanent maxillary first and second molar

The pulp cavity formed of pulp chamber and 4 pulp horns extending under each cusp, each molar has 3 roots with one root canal extending in each. **Bucco-lingual section**
The pulp chamber is broad with two pulp horns
- Wide opening for the palatal and mesiobuccal root canals.
- The palatal root canal is wide and accessible.
- MB root canal is shorter and smaller, in most case it contains 2 root canals with separate apical foramina.
- Distobuccal root has only one root canal.

**Mesio-distal section**
- The pulp chamber is not wide with two pulp horns.
- The mesiobuccal and distobuccal canals are narrow and tapering to the apex.