

APRIL - 2004

[KK 669]

Sub. Code : 4161

SECTION B — (10 × 5 = 50 marks)

FINAL B.D.S. DEGREE EXAMINATION.

Part I

(Modified Regulations) — II

**Paper I — ORTHODONTICS AND DENTO FACIAL
ORTHOPAEDICS**

Time : Three hours Maximum : 100 marks

Sec. A & B : Two hours and Sec. A & B : 80 marks
forty minutes

Section C : Twenty minutes Section C : 20 marks

Answer Sections A and B in the SAME Answer Book.

Answer Section C in the answer sheet provided.

SECTION A — (2 × 15 = 30 marks)

1. What are the clinical implications of growth and development? (15)
2. Define a functional appliance. What are the indications, mode of action and design of a FR II appliance. (15)

3. Write short notes on :

- (a) Nasal septae cartilage
- (b) Thumb sucking habit
- (c) Face mask
- (d) Hand wrist radiograph
- (e) Pressure tension hypothesis
- (f) Simons classification
- (g) Extra oral traction
- (h) Orthognathic surgery
- (i) Cortical anchorage
- (j) Preadjusted Edgewise appliance

AUGUST - 2004

[KL 669]

Sub. Code : 4161

FINAL B.D.S. DEGREE EXAMINATION.

Part I

(Modified Regulations) — II

**Paper I — ORTHODONTICS AND DENTOFACIAL
ORTHOPAEDICS**

Time : Three hours

Maximum : 100 marks

Sec. A & B : Two hours and
forty minutes

Sec. A & B : 80 marks

Section C : Twenty minutes

Section C : 20 marks

Answer Sections A and B in the **SAME** Answer Book.

Answer Section C in the Answer Sheet provided.

Answer **ALL** questions.

SECTION A — (2 × 15 = 30 marks)

1. What are the different theories of growth? Explain the functional Matrix hypothesis in detail. (15)
2. Classify the etiology of malocclusion. Describe the role of mouth breathing in the development of open bite malocclusion. (15)

SECTION B — (10 × 5 = 50 marks)

3. Write short notes on :
 - (a) Rapid Palatal Expansion.
 - (b) Cephalo Caudal gradient of growth
 - (c) Fixed functional appliance
 - (d) Rotational Relapse
 - (e) Envelop of discrepancy
 - (f) Cephalometric radiograph
 - (g) Buccinator Mechanism
 - (h) Fixed appliance
 - (i) Face mask
 - (j) Inclined plane.

FEBRUARY - 2005

[KM 689]

Sub. Code : 4161

FINAL B.D.S. DEGREE EXAMINATION.

(Modified Regulations — II)

Part I

Paper I — ORTHODONTICS AND DENTO FACIAL
ORTHOPAEDICS

Time : Three hours Maximum : 100 marks

Sec. A & B : Two hours and Sec. A & B : 80 marks
forty minutes

Section C : Twenty minutes Section C : 20 marks

Answer Sections A and B in the SAME Answer Book.

Answer Section C in the answer sheet provided.

SECTION A — (2 × 15 = 30 marks)

1. Define abnormal pressure habits. Write in detail about the classification, clinical findings and treatment for mouth breathers. (15)

2. Define anchorage. What are the different types of anchorage? Discuss with examples. (15)

SECTION B — (10 × 5 = 50 marks)

3. Write short notes on :

- (a) Tweeds analysis
- (b) Inclined plane
- (c) Carpal bones
- (d) Spot welder
- (e) RME
- (f) Springs
- (g) Impacted tooth and its orthodontic correction
- (h) Nance Carey's analysis
- (i) Jackson triad
- (j) Occlusal Radiographs.

AUGUST - 2005

[KN 669]

Sub. Code : 4161

FINAL B.D.S. DEGREE EXAMINATION.

(Modified Regulations — II, III)

**Paper I — ORTHODONTICS AND DENTO FACIAL
ORTHOPAEDICS**

Time : Three hours Maximum : 100 marks

Sec. A & B : Two hours and Sec. A & B : 80 marks
forty minutes

Section C : Twenty minutes Section C : 20 marks

Answer Sections A and B in the SAME Answer Book.

Answer Section C in the answer sheet provided.

SECTION A — (2 × 15 = 30 marks)

1. Define and classify functional appliances. Describe in detail, the activator.
2. What are the various preventive orthodontic procedures? Explain in detail the various space maintainers.

SECTION B — (10 × 5 = 50 marks)

3. Write short notes on :
 - (a) Expanding "V" principle
 - (b) Drawbacks of Angle's classification
 - (c) Mouth breathing habit

- (d) Reciprocal anchorage
 - (e) Rapid palatal expansion
 - (f) Wolf's law of bone transformation
 - (g) Anterior bite planes
 - (h) Positioners
 - (i) Buccal canine retraction
 - (j) Face mask therapy.
-

FEBRUARY - 2006

[KO 669]

Sub. Code : 4161

FINAL B.D.S. DEGREE EXAMINATION.

(Modified Regulations — II, III)

Paper I — ORTHODONTICS AND DENTO FACIAL
ORTHOPAEDICS

Time : Three hours

Maximum : 100 marks

Sec. A & B : Two hours and
forty minutes

Sec. A & B : 80 marks

Sec. C : Twenty minutes

Sec. C : 20 marks

Answer Sections A and B in the SAME Answer Book.

Answer Section C in the Answer Sheet provided.

Answer ALL questions.

SECTION A — (2 × 15 = 30 marks)

1. Describe the aetiology, diagnosis and treatment of angle's class III malocclusion patients. (15)
2. Enumerate the various methods of gaining space and discuss extractions in orthodontics. (15)

SECTION B — (10 × 5 = 50 marks)

3. Write short notes on :
 - (a) Endochondral bone formation
 - (b) Early loss of deciduous teeth
 - (c) Resection and osteotomies
 - (d) Butler's field theory
 - (e) Development of palate
 - (f) Electromyography in orthodontics
 - (g) Arch perimeter analysis
 - (h) Springs
 - (i) Uses of cephalometrics
 - (j) Wrought cobalt-chromium-nickel alloys.

AUGUST - 2006

[KP 669]

Sub. Code : 4161

FINAL B.D.S DEGREE EXAMINATION.

(Modified Regulations — II, III)

**Paper I — ORTHODONTICS AND DENTO FACIAL
ORTHOPAEDICS**

Time : Three hours

Maximum : 100 marks

**Descriptive : Two hours and
forty minutes**

Descriptive : 80 marks

Objective : Twenty minutes

Objective : 20 marks

Answer ALL questions.

Write essay on :

- 1. Discuss in detail the clinical implications of Growth and Development and enumerate the use of cephalometric to study the same. (20)**
- 2. Classify etiology of malocclusion. Discuss general factors in detail. (15)**
- 3. Define growth and development. Discuss post-natal growth of maxilla. (15)**

4. Write short notes on :

(6 × 5 = 30)

- (a) Flux and antflux**
 - (b) Carpal radiographs**
 - (c) Extra oral anchorage**
 - (d) Pseudo class III**
 - (e) Buccinator mechanism**
 - (f) Undermining resorption.**
-

FEBRUARY - 2007

[KQ 669]

Sub. Code : 4161

FINAL B.D.S. DEGREE EXAMINATION.

(Modified Regulations - II, III)

**Paper I — ORTHODONTICS AND DENTO FACIAL
ORTHOPAEDICS**

Time : Three hours

Maximum : 100 marks

**Descriptive : Two hours and
forty minutes**

Descriptive : 80 marks

Objective : Twenty minutes

Objective : 20 marks

Answer ALL questions.

1. Define and classify functional appliances. Write in detail about Frankel's appliance. (20)
2. Define optimal orthodontic force. Discuss tissue changes subsequent to light and heavy forces. (15)
3. Describe various classifications of malocclusions. Write the advantages and disadvantages of Angles classification. (15)

4. Write short notes on :

(6 × 5 = 30)

- (a) Functional matrix theory.
 - (b) Hand wrist radiographs.
 - (c) Reinforced anchorage.
 - (d) Features of class II div 1 malocclusion.
 - (e) Uses of Shody models.
 - (f) Transient malocclusion.
-

AUGUST 2007

[KR 669]

Sub. Code : 4161

FINAL B.D.S. DEGREE EXAMINATION.

(Modified Regulations – II, III)

**Paper I — ORTHODONTICS AND DENTOFACIAL
ORTHOPAEDICS**

Time : Three hours

Maximum : 100 marks

**Descriptive : Two hours and
forty minutes**

Descriptive : 80 marks

Objective : Twenty minutes

Objective : 20 marks

Answer ALL questions.

I. Essays : (2 × 15 = 30)

1. Enumerate the various theories of growth and explain in detail functional matrix theory as related to cranio-facial growth. (15)

2. Define retention. Explain the various theorems of retention. (15)

II. Short notes : (10 × 5 = 50)

3. (a) Law of canine.

(b) Tongue thrusting habit.

(c) Line of treatment in cleft palate patients.

(d) Space regainers.

(e) Head gears.

(f) Types of tooth movement.

(g) Management of anterior crossbite.

(h) Components of fixed appliance.

(i) 18 – 8 stainless steel.

(j) Therapeutic extraction.

August 2008

[KT 669]

Sub. Code: 4161

FINAL B.D.S DEGREE EXAMINATION

(Modified Regulations – III)

Paper I– ORTHODONTICS AND DENTOFACIAL ORTHOPAEDICS

Q.P. Code: 544161

Time: Three hours

Maximum: 100 Marks

ANSWER ALL QUESTIONS

I. Essays:

(2 X 20 = 40)

1. Define and classify Myofunctional appliance. Discuss any one appliance in detail.
2. Discuss in detail about various interceptive procedures in Orthodontics.

II. Write short notes on:

(10 X 6 = 60)

1. Imaginary Occlusal Curves.
 2. Keslings Diagnostc Set up.
 3. Phases of Tooth Movement.
 4. Muscular anchorage.
 5. Serial Extraction.
 6. Proximal Stripping.
 7. Classification and Designing of Springs.
 8. Causes of Relapse in Orthodontics.
 9. Vital Staining.
 10. Cartilaginous theory.
-

February 2009

[KU 669]

Sub. Code : 4161

FINAL B.D.S DEGREE EXAMINATION

(Modified Regulations – III)

**Paper I – ORTHODONTICS AND DENTOFACIAL
ORTHOPAEDICS**

Q. P. Code : 544161

Time : Three hours

Maximum: 100 Marks

Answer **ALL** questions.

I. Essays : **(2 x 20 = 40)**

1. Define and classify malocclusions. Describe in detail about the advantages, disadvantages and modifications of Angle's classification.
2. Define and classify functional appliances. Describe in detail about Frankel's functional regulator.

II. Write Short notes on : **(10 x 6 = 60)**

1. Soldering and Welding.
2. Cephalometrics.
3. Extra oral anchorage.
4. Acid etching.
5. Slenderisation.
6. Growth spurts.
7. Interceptive orthodontics.
8. Removable appliances.
9. Arch expansion.
10. Serial extraction.

August 2009

[KV 669]

Sub. Code : 4161

FINAL B.D.S DEGREE EXAMINATION

(Modified Regulations – III)

**Paper I – ORTHODONTICS AND DENTOFACIAL
ORTHOPAEDICS**

Q. P. Code : 544161

Time : Three hours

Maximum: 100 Marks

Answer **ALL** questions.

I. Essays : **(2 x 20 = 40)**

1. Define anchorage. Discuss in detail the various types of anchorage with examples and illustrations.
2. Write in detail the postnatal growth of the craniofacial complex and mention the clinical importance of the various growth spurts.

II. Write Short notes on : **(10 x 6 = 60)**

1. Activator.
2. Ackermann and proffit classification.
3. Optimum orthodontic force.
4. Serial extraction.
5. Steiner's analysis.
6. Direct bonding.
7. Rapid maxillary expansion.
8. Functional shift of the mandible.
9. Skeletal malocclusion.
10. Arch wires.

February 2010

[KW 669]

Sub. Code : 4161

FINAL B.D.S DEGREE EXAMINATION

(Modified Regulations – III)

**Paper I – ORTHODONTICS AND DENTOFACIAL
ORTHOPAEDICS**

Q. P. Code : 544161

Time : Three hours

Maximum: 100 Marks

Answer **ALL** questions.

I. Essays : **(2 x 20 = 40)**

1. What are the causes for cleft lip and palate? How will you manage the problems associated with them?
2. Classify orthodontics. What are the procedures under taken in preventive orthodontics and explain in detail.

II. Write Short notes on : **(10 x 6 = 60)**

1. Planning extractions.
2. Skeletal malocclusion.
3. Functional examination.
4. Phases of tooth movement.
5. Planning for space maintenance.
6. Treatment and age.
7. Modifications of activator.
8. Arch expansion.
9. Genetic disorders.
10. Arch wires.

August 2010

[KX 669]

Sub. Code: 4161

FINAL B.D.S DEGREE EXAMINATION

(Modified Regulations – III)

Paper I– ORTHODONTICS AND DENTOFACIAL

ORTHOPAEDICS

Q.P. Code: 544161

Time: Three hours

Maximum: 100 Marks

Answer ALL Questions

I. Essays:

(2 x 20 = 40)

1. Discuss Tissue changes during orthodontic tooth movement.
2. Enumerate various interceptive orthodontic procedures. Explain in detail the indication, contraindication and procedures of serial extraction.

II. Write short notes on:

(10 x 6 = 60)

1. Ugly duckling stage.
2. ANB angle.
3. Growth spurts.
4. Gnathostatic models.
5. Head gears.
6. Delaire's face mask.
7. Leeway's space of Nance.
8. Direct bonding technique.
9. Advantages and disadvantages fixed appliance.
10. Various methods of gaining space.

February 2011

[KY 669]

Sub. Code: 4161

FINAL B.D.S DEGREE EXAMINATION

(Modified Regulations – III)

Paper I - ORTHODONTICS AND DENTOFACIAL ORTHOPAEDICS

Q.P. Code: 544161

Time : Three hours

Maximum : 100 marks

Answer **ALL** questions.

I. Essays:

(2 x 20 = 40)

1. Define Orthodontics and malocclusion. Enumerate the various methods of classify malocclusion. Write in detail Angle's classification of malocclusion – merits, demerits and modifications.
2. What are functional appliances? Classify functional appliances. Discuss activator – mechanism of action, indications, contraindications and modifications.

II. Write short notes on :

(10 x 6 = 60)

1. Pericision.
2. Classification of cleft lip and palate.
3. Simon's classification.
4. Prenatal causes of malocclusion.
5. E.H. Angle.
6. Undermining resorption.
7. Tweed's diagnostic triangle.
8. Reinforced anchorage.
9. Functional space maintainers.
10. Space – Age wires.

August 2011

[KZ 669]

Sub. Code : 4161

FOURTH B.D.S. DEGREE EXAMINATION

ORTHODONTICS AND DENTOFACIAL ORTHOPAEDICS

Q. P. Code : 544161

Time : Three hours

Maximum: 100 Marks

Answer **ALL** questions

I. Essay Questions:

(2 x 20 = 40)

1. Define anchorage in Orthodontics. Classify anchorage. Discuss in detail the different types of anchorage.
2. Enumerate the various methods of classification etiological factors of malocclusion. Write in detail Graber's classification of general factors.

II. Write Short notes on :

(10 x 6 = 60)

1. Define Orthodontics and its branches.
2. Ackermann – Proffit classification of malocclusion.
3. Functional Matrix theory.
4. Steiner's Cephalometric analysis.
5. Space regainers.
6. Undermining resorption.
7. Twin block appliance.
8. Management of anterior cross bite
9. Total space analysis
10. Serial extractions.

February 2012

[LA 669]

Sub. Code: 4161

**FOURTH(FINAL) BDS DEGREE EXAMINATION
PAPER I ORTHODONTICS AND DENTOFACIAL ORTHOPAEDICS**

Q.P. Code: 544161

**Time : 3 hours
(180 Min)**

Maximum : 70 marks

**Answer ALL questions in the same order.
Draw Suitable diagrams wherever necessary**

I. Elaborate on: **(2 x 10 = 20)**

1. Define orthodontics. Enumerate the various classifications of malocclusion.
Discuss in detail Angle's classification
2. Write the various schools of thought of retention Discuss in detail the theorems of retention.

II. Write notes on: **(10 x 5 = 50)**

1. Safety valve mechanism
2. Undermining resorption
3. Wolff's law and stress trajectories
4. Circumferential supracrestal fibrotomy
5. Activator Vs Frankel
6. Wits analysis
7. Meckels cartilage
8. Space Age wires
9. Guided springs
10. Hyrax screw

[LB 669]

AUGUST 2012

Sub. Code: 4161

**FOURTH YEAR B.D.S. DEGREE EXAM
PAPER I – ORTHODONTICS AND
DENTOFACIAL ORTHOPAEDICS**

Q.P.Code: 544161

Time: 180 Minutes

Maximum: 100 Marks

Answer ALL questions in the same order

I. Elaborate on:

**Pages Time Marks
(Max.)(Max.)(Max.)**

- | | | | |
|--|----|----|----|
| 1. Mention about the essential diagnostic aids and write about the role orthodontic study models to aid in treatment planning? | 19 | 30 | 20 |
| 2. Define anchorage? Classify anchorage and discuss in detail about the different types of anchorage. | 19 | 30 | 20 |

II. Write notes on:

- | | | | |
|--|---|----|---|
| 1. Cephalic index. | 3 | 10 | 5 |
| 2. Methods of gaining space. | 3 | 10 | 5 |
| 3. Role of Adenoids in malocclusion. | 3 | 10 | 5 |
| 4. Ugly ducking stage. | 3 | 10 | 5 |
| 5. Drift Vs Displacement. | 3 | 10 | 5 |
| 6. Mode of action of Activator. | 3 | 10 | 5 |
| 7. Twin Study. | 3 | 10 | 5 |
| 8. Sicher's theory. | 3 | 10 | 5 |
| 9. Different types of springs and their uses. | 3 | 10 | 5 |
| 10. Definition, indication and contraindications of fixed appliance. | 3 | 10 | 5 |
| 11. Normal and abnormal function of stomatognathic system. | 3 | 10 | 5 |
| 12. Nickel titanium wires. | 3 | 10 | 5 |

[LC 669]

FEBRUARY 2013

Sub. Code: 4161

FOURTH YEAR B.D.S. DEGREE EXAM

PAPER I – ORTHODONTICS AND

DENTOFACIAL ORTHOPAEDICS

Q.P.Code: 544161

Time: 180 Minutes

Maximum: 70 Marks

I. Elaborate on:

(2x10=20)

1. Define Growth and explain Functional matrix theory in detail.
2. What are Removal orthodontic appliances? Explain in detail the various parts of it and add a note on Adam's clasp.

II. Write notes on:

(10x5=50)

1. Growth spurt.
2. Ackermann-Profitt classification.
3. Space gaining method.
4. 18/8 Stainless steel.
5. Prenatal ethiology of malocclusion.
6. Poorman's Cephalometry
7. Crossbite correction.
8. Speech sounds.
9. Flux and Antiflux.
10. Genetics in Orthodontics.

[LD 669]

AUGUST 2013

Sub. Code: 4161

FOURTH YEAR B.D.S. DEGREE EXAM

PAPER I – ORTHODONTICS AND DENTOFACIAL ORTHOPAEDICS

Q.P.Code: 544161

Time: 180 Minutes

Maximum: 70 Marks

I. Elaborate on:

(2x10=20)

1. Enumerate the various Theories of Growth. Discuss in detail the post natal growth of Mandible.
2. Classify and enumerate the various Diagnostic Aids in Orthodontics. Explain in detail about Carey's Analysis.

II. Write notes on:

(10x5=50)

1. Reciprocal Anchorage
2. Oral Screen
3. Overjet, Overbite.
4. Hawley Retainer.
5. Growth spurts
6. Welding in Orthodontics
7. Factors affecting Growth
8. Curve of Spee
9. Tweed Triangle
10. Ideal Occlusion.

[LE 669]

FEBRUARY 2014

Sub. Code:4161

FOURTH YEAR B.D.S. DEGREE EXAM
PAPER I - ORTHODONTICS AND
DENTOFACIAL ORTHOPAEDICS
Q.P Code: 544161

Time: 180 Minutes

Maximum: 70 marks

I. Elaborate on:

(2X10=20)

1. Tissue response to orthodontic force application.
2. Define cephalometrics. Describe the cephalostat and write in detail about Steiner's analysis.

II. Write Notes on:

(10X5=50)

1. Direct ossification
2. Bionator
3. Adams clasp
4. Spacing in deciduous dentition
5. Stress trajectories
6. Merits and demerits of Angel's classification
7. Bolton's ratio
8. Headgears
9. Functional examination in orthodontics
10. Fixed retainers

[LF 669]

AUGUST 2014

Sub. Code:4161

**FOURTH YEAR B.D.S. DEGREE EXAM
PAPER I - ORTHODONTICS AND
DENTOFACIAL ORTHOPAEDICS**

Q.P Code: 544161

Time: 180 Minutes

Maximum: 70 marks

I. Elaborate on:

(2X10=20)

1. Tabulate the Chronology of eruption in Permanent Dentition, and add a note on the clinical significance of the various eruption stages.
2. Enumerate the methods of gaining space in Orthodontics, Write in detail about proximal reduction.

II. Write Notes on:

(10X5=50)

1. Malocclusion.
2. Blanch Test.
3. Biological Indicators of Maturity.
4. Anterior Cross Bite.
5. Soldering in Orthodontics.
6. Ugly Duckling Stage.
7. Types of Tooth Movement.
8. Frenectomy.
9. Branches of Orthodontics.
10. Primary Molar Relationship.

FOURTH YEAR B.D.S. DEGREE EXAM

**PAPER I - ORTHODONTICS AND
DENTOFACIAL ORTHOPAEDICS**

Q.P Code: 544161

Time: 180 Minutes

Maximum: 70 Marks

I. Elaborate on:

(2 x 10 = 20)

1. Define retention and relapse. What are the causes for relapse and methods to prevent relapse?
2. Write about the etiology, clinical features, diagnosis and management of class II division 1 malocclusion in a growing child.

II. Write Notes on:

(10 x 5 = 50)

1. Safety valve mechanism.
2. Functional matrix.
3. Resorption patterns following orthodontic force application.
4. Nitinol wires.
5. Incisal liability.
6. Chin cup.
7. Dewel's technique.
8. Oral screen.
9. Compensating curves.
10. Extra oral examination.

FOURTH YEAR B.D.S. DEGREE EXAMINATION

PAPER I – ORTHODONTICS AND DENTOFACIAL ORTHOPAEDICS

Q.P. Code: 544161

Time : Three Hours

Maximum : 70 marks

Answer All Questions

I. Elaborate on:

(2 x 10 = 20)

1. What is a “Cephalostat”?

Write 4 difference between a lateral view skull radiograph and a cephalogram.

Write about the need for a cephalometric analysis.

Write about any 4 cephalometric parameters and their clinical inference.

2. Define a “Growth Spurt”.

Write the types of growth spurts and significance of each spurt.

List the different methods of assessing skeletal growth status and describe any one method.

II. Write notes on :

(10 x 5 = 50)

1. Adam’s Clasp.

2. Classify upper expansion appliances and write the difference between Slow and Rapid Maxillary Expansion Appliances. Explain about any one expansion appliance.

3. Head Gears.

4. Types of orthodontic tooth movement.

5. Arch perimeter analysis.

6. Correction of Anterior Open Bites.

7. Methods of gaining space.

8. Reinforced anchorage.

9. Classification of Cleft palate and Lip.

10. What is Retention? Write briefly theorems involved.

FOURTH YEAR B.D.S. DEGREE EXAMINATION

PAPER I – ORTHODONTICS AND DENTOFACIAL ORTHOPAEDICS

Q.P. Code : 544161

Time : Three Hours

Maximum : 70 Marks

Answer All Questions

I. Elaborate on:

(2 x 10 = 20)

1. What is an Ideal Orthodontic Force? Name the types of orthodontic forces.
Name the theories of tooth movement. Write the histological changes in periodontium following application of different magnitudes of orthodontic forces.
2. An eight year old boy was diagnosed to be having a Skeletal Class II discrepancy with Angle's Dentoalveolar CI II division 1 subdivision Malocclusion. Describe the extra oral clinical features, probable intra oral clinical features. Write the various skeletal combinations and cephalometric findings contributing to such a skeletal discrepancy. Write the treatment for each of such skeletal situation.

II. Write Notes on:

(10 x 5 = 50)

1. Infantile swallowing.
2. Reciprocal Anchorage.
3. Positioning of an orthodontic patient in dental chair for clinical examination of facial features and its Importance.
4. Systemic diseases that cause Malocclusion.
5. Mixed dentition analysis.
6. Correction of Anterior cross bite.
7. Reverse Pull Head Gear.
8. Any three local etiological factors for malocclusion.
9. Treatment principle for functional appliances.
10. Cephalocaudal growth gradient.
