

Most Updated and Latest Edition 2022

Covering all Recent Updates & Qs up to June 2022 Exams

Most Comprehensive Colored Book on Forensic Medicine with Detailed Medicolegal Aspects
The Only Book Covering Recent Amendments in the Indian Laws and Numerous Case Studies

New SARP Series for NEET/INI-CET

Forensic Medicine

Nothing Beyond for PGMEE/NEXT

As per the New Pattern Exams (NEXT) with many Clinical Case-Based Questions

References and Updates from Reddy's 35/e, Parikh's 7/e, Harrison's 21/e

5th
EDITION

Papers Covered

- INI-CET - 2022-21
- Recent Qs (Jan) 2022 - 2012
- AIIMS June 2020 - 2010
- Expected NEXT/Clinical Pattern Qs
- CBME-Based Subjective Qs with Chapter References

- Written and Compiled by Leading Faculty and Subject Expert of Forensic Medicine
- Enriched with Recent/Latest Updates



Includes

800+

MCQs of
Recent Exams

200+

CBQs

200+

IBQs

500+

Clinical
Illustrations/Images



CBS Publishers & Distributors Pvt. Ltd.

J Magendran

New SARP Series for NEET/INI-CET

Forensic Medicine

Nothing Beyond for PGMEE/NEXT

As per the New Pattern Exams (NEXT) with many Clinical Case-Based Questions

References and Updates from Reddy's 35/e, Parikh's 7/e, Harrison's 21/e

• 5th Edition •

J Magendran MBBS, MD

Professor

Saveetha Medical College, Saveetha University
Chennai, Tamil Nadu, India

Dedicated to Education



CBS Publishers & Distributors Pvt Ltd

• New Delhi • Bengaluru • Chennai • Kochi • Kolkata • Lucknow
• Mumbai • Hyderabad • Nagpur • Patna • Pune • Vijayawada

Dedication

I dedicate this book to My Parents & My Dear Wife

Preface

Dear friends,

With each edition, the contentment keeps increasing manifolds and gives more motivation to bring out the best and better in each edition.

This innovative book for Forensic Medicine has received great reviews and has indeed made it the 'BESTSELLER'.

This fifth edition has been designed keeping in mind the latest changes in the curriculum—CBME-based model and comprehensive.

More clinical-based scenarios and clinical based questions have been included and discussed in detail.

Images have been given elaboratively which will help you in every step to succeed in all your exams, especially the upcoming NEXT.

The 'legal sections' have been dealt with specially in a separate chapter, so that memorizing and remembering these are always easy and fun.

I was overwhelmed to see the response from all the students, both PG & UG and I hope to receive your wonderful support as always.

Make the best use of it...

**"INSPIRATION IS PERSPIRATION. 2% IS GENIUS AND 98% IS HARD WORK"—THOMAS ALVA EDISON.
YOU HAVE IT IN 'YOU' TO SUCCEED.....**

J Magendran

Contents

Preface	iii
Acknowledgments	v
How to Decode this Book?	vi
CBME-Based Subjective Questions with Chapter References	x
Latest Exam Questions 2022	xvii
INI-CET May 2022	xviii
Recent Questions May 2022	xviii
FMGE June 2022	xix



1 FORENSIC THANATOLOGY 1

Let's Know the Terms First	2
Chapter at a Glance	17
Frequently Asked Concepts—Last-Minute Tidbits	18
Image-Based Questions	19
Answers with Explanations to Image-Based Questions	22
NEXT/Clinical Case-Based Questions	23
Answers to NEXT/Clinical Case-Based Questions	24
Multiple Choice Questions	25
Answers with Explanations	26



2 HUMAN IDENTIFICATION 29

Let's Know the Terms First	30
Chapter at a Glance	48
Frequently Asked Concepts—Last-Minute Tidbits	50
Image-Based Questions	51
Answers with Explanations to Image-Based Questions	56
NEXT/Clinical Case-Based Questions	58
Answers to NEXT/Clinical Case-Based Questions	59
Multiple Choice Questions	60
Answers with Explanations	61



3 ASPHYXIAL DEATHS 63

Chapter at a Glance	80
Frequently Asked Concepts—Last-Minute Tidbits	81
Image-Based Questions	82
Answers with Explanations to Image-Based Questions	85
NEXT/Clinical Case-Based Questions	86
Answers to NEXT/Clinical Case-Based Questions	87
Multiple Choice Questions	88
Answers with Explanations	89



4 FORENSIC TRAUMATOLOGY 91

Let's Know the Terms First.....	92
Chapter at a Glance.....	122
Frequently Asked Concepts—Last-Minute Tidbits	123
Image-Based Questions	124
Answers with Explanations to Image-Based Questions	130
NEXT/Clinical Case-Based Questions.....	132
Answers to NEXT/Clinical Case-Based Questions.....	134
Multiple Choice Questions	135
Answers with Explanations	136



5 FORENSIC TOXICOLOGY 139

Let's Know the Basics.....	140
Chapter at a Glance.....	165
Frequently Asked Concepts—Last-Minute Tidbits	167
Image-Based Questions	169
Answers with Explanations to Image-Based Questions	175
NEXT/Clinical Case-Based Questions.....	177
Answers to NEXT/Clinical Case-Based Questions.....	179
Multiple Choice Questions	180
Answers with Explanations	181



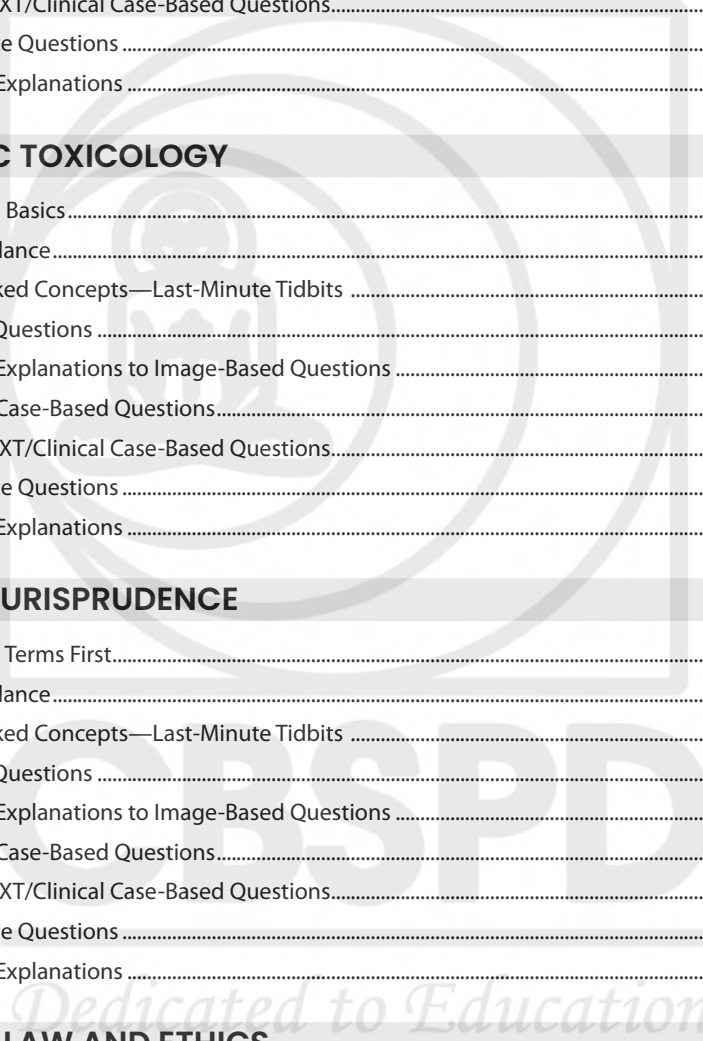
6 SEXUAL JURISPRUDENCE 185

Let's Know the Terms First.....	186
Chapter at a Glance.....	207
Frequently Asked Concepts—Last-Minute Tidbits	209
Image-Based Questions	210
Answers with Explanations to Image-Based Questions	212
NEXT/Clinical Case-Based Questions.....	213
Answers to NEXT/Clinical Case-Based Questions.....	214
Multiple Choice Questions	216
Answers with Explanations	217



7 MEDICAL LAW AND ETHICS 219

Let's Know the Terms First.....	220
Chapter at a Glance.....	234
Frequently Asked Concepts—Last-Minute Tidbits	236
Image-Based Questions	237
Answers with Explanations to Image-Based Questions	238
NEXT/Clinical Case-Based Questions.....	239
Answers to NEXT/Clinical Case-Based Questions.....	240
Multiple Choice Questions	241
Answers with Explanations	241





8 FORENSIC PSYCHIATRY, STARVATION AND BLOOD STAINS 243

Let's Know the Terms First.....	244
Chapter at a Glance.....	253
Frequently Asked Concepts—Last-Minute Tidbits	254
Image-Based Questions	255
Answers with Explanations to Image-Based Questions	257
NEXT/Clinical Case-Based Questions.....	258
Answers to NEXT/Clinical Case-Based Questions.....	258
Multiple Choice Questions	259
Answers with Explanations	260



9 RULES, SECTIONS AND DECEPTION DETECTION TECHNIQUES 261

Image-Based Questions	269
Answers with Explanations to Image-Based Questions	269
Multiple Choice Questions.....	270
Answers with Explanations	270



10 DOWN THE MEMORY LANE 271

Milestones	272
------------------	-----



11 SPOTTERS 275

CBSPD

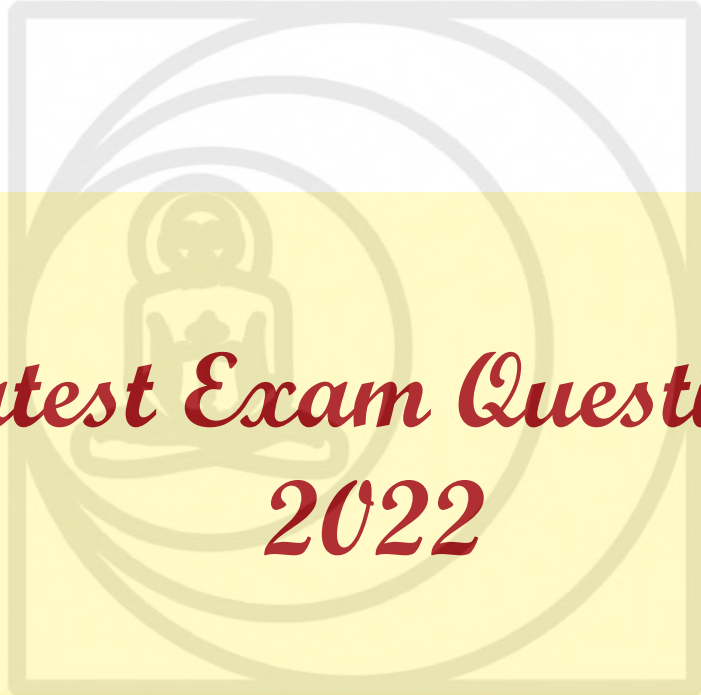
Dedicated to Education



CBME-Based Subjective Questions with Chapter References*

Competencies	Subjective Questions	For Answer Refer to Chapter
General Information		
FM1.1	Demonstrate knowledge of basics of Forensic Medicine like definitions of Forensic medicine, Clinical Forensic Medicine, Forensic Pathology, State Medicine, Legal Medicine and Medical Jurisprudence	Chapter 7
FM1.2	Describe history of Forensic Medicine	—
FM1.3	Describe legal procedures including Criminal Procedure Code, Indian Penal Code, Indian Evidence Act, Civil and Criminal Cases, Inquest (Police Inquest and Magistrate's Inquest), Cognizable and Non-cognizable offences	Chapter 7
FM1.4	Describe Courts in India and their powers: Supreme Court, High Court, Sessions court, Magistrate's Court, Labour Court, Family Court, Executive Magistrate Court and Juvenile Justice Board	Chapter 7
FM1.5	Describe Court procedures including issue of Summons, conduct money, types of witnesses, recording of evidence oath, affirmation, examination in chief, cross examination, re-examination and court questions, recording of evidence & conduct of doctor in witness box	Chapter 7
FM1.6	Describe Offenses in Court including Perjury; Court strictures vis-a-vis Medical Officer	Chapter 7
FM1.7	Describe Dying Declaration & Dying Deposition	Chapter 7
FM1.8	Describe the latest decisions/notifications/resolutions/circulars/standing orders related to medicolegal practice issued by Courts/Government authorities, etc.	—
FM1.9	Describe the importance of documentation in medical practice in regard to medicolegal examinations, Medical Certificates and medicolegal reports especially <ul style="list-style-type: none"> • Maintenance of patient case records, discharge summary, prescribed registers to be maintained in Health Centers. • Maintenance of medicolegal register like accident register. • Documents of issuance of wound certificate • Documents of issuance of drunkenness certificate. • Documents of issuance of sickness and fitness certificate. • Documents for issuance of death certificate. • Documents of Medical Certification of Cause of Death - Form Number 4 and 4A • Documents for estimation of age by physical, dental and radiological examination and issuance of certificate 	—
FM1.10	Select appropriate cause of death in a particular scenario by referring ICD 10 code	—
FM1.11	Write a correct cause of death certificate as per ICD 10 document	—
Forensic Pathology		
FM2.1	Define, describe and discuss death and its types including somatic/clinical/cellular, molecular and brain-death, Cortical Death and Brainstem Death	Chapter 1
FM2.2	Describe and discuss natural and unnatural deaths	—
FM2.3	Describe and discuss issues related to sudden natural deaths	—
FM2.4	Describe salient features of the Organ Transplantation and The Human Organ Transplant (Amendment) Act 2011 and discuss ethical issues regarding organ donation	Chapter 1
FM2.5	Discuss moment of death, modes of death - coma, asphyxia and syncope	Chapter 1
FM2.6	Discuss presumption of death and survivorship	Chapter 1
FM2.7	Describe and discuss suspended animation	Chapter 1
FM2.8	Describe and discuss postmortem changes including signs of death, cooling of body, postmortem lividity, rigor mortis, cadaveric spasm, cold stiffening and heat stiffening	Chapter 1
FM2.9	Describe putrefaction, mummification, adipocere and maceration	Chapter 1
FM2.10	Discuss estimation of time since death	Chapter 1
FM2.11	Describe and discuss autopsy procedures including postmortem examination, different types of autopsies, aims and objectives of postmortem examination	Chapter 1

*Important competency-based topics covered



Latest Exam Questions 2022

1. INI-CET May 2022
2. Recent Questions May 2022
3. FMGE June 2022

Dedicated to Education



INI-CET MAY 2022

- Fingerprint ridges appear by:**
 - 26 to 28 weeks of intrauterine life
 - 12 to 16 weeks of intrauterine life
 - 24 to 28 weeks of intrauterine life
 - 32 to 36 weeks of intrauterine life
- Following is used to identify the vaginal cells on glans penis during the examination of accused of rape:**
 - Precipitin test
 - Florence test
 - Lugols iodine
 - Toluidine blue
- Identify the mechanical injury given in the picture:**



- Graze abrasion
 - Hesitation cuts
 - Six penny bruise
 - Patterned abrasion
- Identify the poisonous plant having yellow flowers and seeds are contained in prickly capsules:**



- Argemone Mexicana (sialkanta)
 - Nerium odorum
 - Papaver somniferum
 - Calotropis procera
- In chronic arsenic poisoning, following clinical features are not present:**
 - Aldrich – mees line over the nails
 - Raindrop type of pigmentation resemble like fading measles rash
 - Mixed neuropathy (motor + sensory)
 - Luminescent vomitus
 - Bone marrow depression

- Treatment of acute arsenic poisoning:**
 - Dialysed iron
 - Freshly prepared hydrated ferric oxide
 - CA EDTA
 - Dimercaprol or BAL
- In case of alleged murder of 'A' by 'B' at a certain place on a particular day and time, 'C' saw 'B' with a knife on that day at that place a few minutes before the murder. 'C' States this in the court of law. This type of evidence is:**
 - Direct evidence
 - Indirect evidence or circumstantial evidence
 - Hearsay evidence
 - Hostile witness
- All the following are muscarinic manifestations of organo-phosphorus poisoning; except:**
 - Urinary incontinence and diuresis
 - Bradycardia
 - Mydriasis
 - Bronchoconstriction and PUL
- Most characteristic feature of muscarinic symptoms in OPC poisoning is/are:**
 - Respiratory symptoms like salivation, rhinorrhea, bronchorrhoea and bronchospasm
 - Mydriatic pupil
 - Bradycardia
 - Skeletal muscle contraction
- A 27-year-old patient comes to emergency with salivation, diarrhea, watery eyes, dysuria. What will be first line of management?**
 - IV calcium gluconate
 - Atropine
 - Pralidoxime
 - Glucagon
- Not a feature of cocaine intoxication:**
 - Tingling and numbness of hands and feet
 - Hypertension
 - Hyperthermia
 - Constricted pupil and bradycardia
- Which of the following causes hypertension?**
 - Cocaine
 - Acute alcoholism
 - OP poisoning
 - Acute arsenic poisoning

RECENT QUESTIONS MAY 2022

- A female has come to gynecologist for hysterectomy. The doctor explains the benefits & risks of the procedure & obtained consent. This type of consent is:**
 - Implied consent
 - Informed consent
 - Blanket consent
 - Opt out consent
- A doctor who is drunk, while performing the surgery, injured a major vessel & death of patient occurred. This is:**
 - Civil negligence
 - Criminal negligence
 - Therapeutic misadventure
 - Dichotomy



Forensic Thanatology

Dedicated to Education

“The Difference between Ordinary and Extraordinary is just that little Extra.”

—Jimmy Johnson



LET'S KNOW THE TERMS FIRST

Thanatology

- The **study of death**^Q in all its aspects

Taphonomy

- The study of the decomposition processes of human remains

Death

- Section 46 IPC
- The word "death" denotes the death of a human being, unless the contrary appears from the context
- The Registration of Births and Deaths Act, 1969
- "Death" means the permanent disappearance of all evidences of life at any time after live-birth has taken place.

Bishop's tripod of life

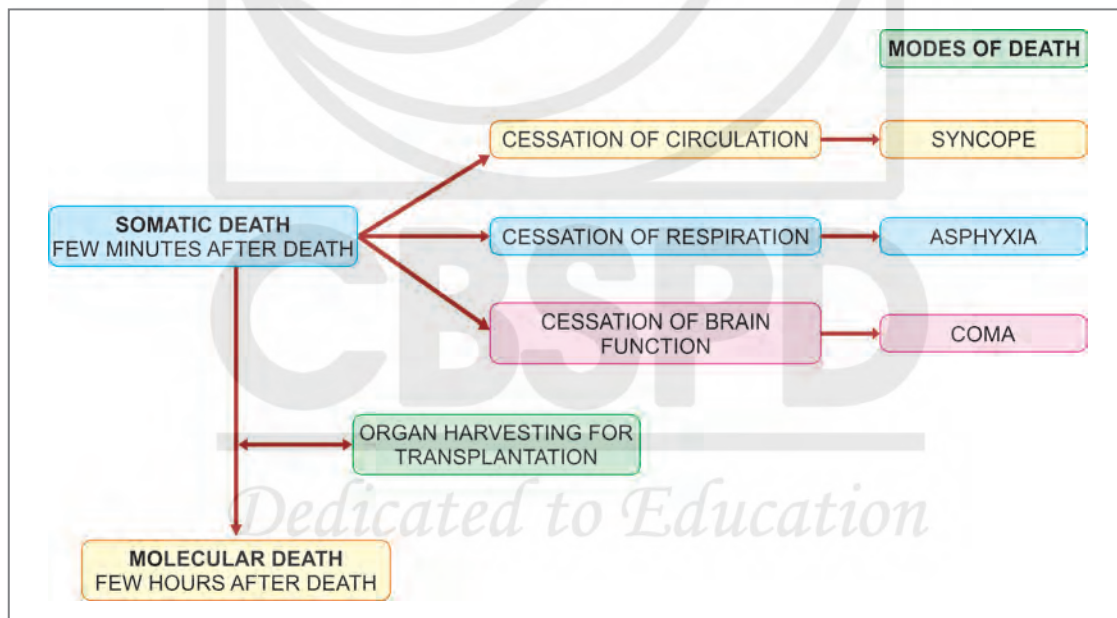
- Three interdependent vital functions of the body
- Respiration, Circulation and Brain function (i.e. lungs, heart and brain)

Sudden death

- When the person is not known to have any disease/injury/poisoning, dies **within 24 hours** after the onset of illness (WHO)
- Most commonly due to diseases of CVSQ (45–50%)

TYPES OF DEATH

- Somatic or clinical death
- Molecular or cellular death



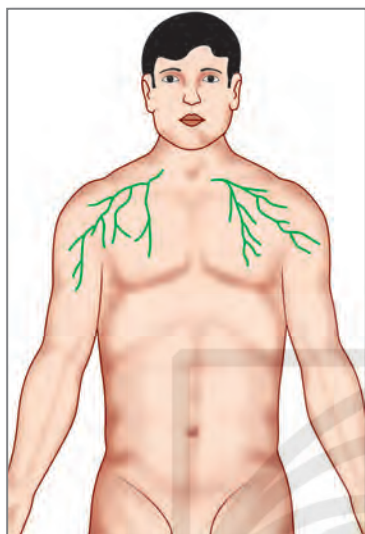
APPARENT DEATH/SUSPENDED ANIMATION

(The person appears to be dead but he is not actually dead)

- The signs of life are reduced to very minimum that it cannot be detected by routine clinical methods.
- Suspended animation can be produced *Voluntarily*^Q and involuntarily.

Mechanism

- During this state, the individual cells utilize the dissolved O₂ in body fluids and remain **viable**.
- Thus the person comes back to life on resuscitation^Q.



Postmortem blisters

Mechanism

- In decomposition, bacteria spread all over the body through the blood vessels; using the proteins and carbohydrates of the blood as culture media
- Their passage is marked by the conversion of hemoglobin to **sulfmethemoglobin^Q** in the blood vessels.
- This results in **greenish staining of inner walls of the vessels^Q**, a **marbled (road map)^Q** appearance of the skin.

Effects of Gas Formation

- Gases formed: Ammonia, carbon dioxide, hydrogen sulfide, phosphorated hydrogen and methane.
- **Principal gas: Hydrogen sulfide^Q**

Effects	Timeline
Skin Blisters First seen on the lower surface of trunk and thighs	18–24 hours ^Q
Abdomen gets distended due to accumulation of gases in the intestines (Gas stiffening^Q)	18–36 hours
Postmortem purge^Q: <i>Diaphragm is pushed up compressing the lungs and heart; blood-stained frothy fluid exudes from the mouth and nostrils</i>	18–36 hours
Foamy liver/honey comb liver The liver assumes a ' honey comb^Q ' ('foamy' or 'Swiss cheese') appearance due to formation of air bubbles. (Note: Nutmeg liver is seen in chronic venous congestion)	24–36 hours
Skin slippage Anus and uterus prolapsed Hair and nails become loose and may be taken out easily	2–3 days
Skin of hand and feet may come off in a ' glove and stocking ' manner ^Q	3–5 days ^Q
Separation of skull sutures in children	3–5 days

Colliquative Putrefaction (Liquefaction)—5–10 Days^Q

Putrefactive changes of organs in the following order:

- **Larynx and trachea (Earliest organ)^Q**
- Stomach, intestines and spleen.
- Liver
- **Brain**
- **Heart**
- Kidney and bladder
- **Prostate, uterus^Q**
- Skin, muscle and tendon
- **Bones & Teeth^Q**

MNEMONIC

Sequence of putrefaction of organs-for middle order

SISter LILly's Brittle Heart

- **SISter**- Stomach, Intestine, Spleen
- **Lilly** – Liver
- **Brittle** – brain
- **Heart**
- *In general, **Bone is the last organ to putrefy.***
- But among the visceral organs, prostate and nulliparous uterus are the last to putrefy.

Extra Edge

- Prostate and uterus being the last visceral organs to decompose, they help to identify the sex of the dead bodies in **advanced state of decomposition.**
- **Pink teeth:** Seen in *putrefaction^Q* as a result of hemolysis of extravasated blood in dental tubules.
- **Postmortem luminescence**
 - Usually due to contamination by bacteria, like *Photobacterium fischeri*
 - Light comes from the bacteria.
 - *Luminescent fungi, Armillaria mellea,* are other sources of light.

Conditions Influencing Putrefaction Process

(Generally, moisture and bacteria enhance the putrefactive process)



- **Y-shaped incision:**
 - Two incisions each starting from acromion processes, meet in the midline near xiphisternum and then extend downwards straight to pubis.
- **Modified Y-shaped incision:**
 - An incision is made in midline from suprasternal notch to symphysis pubis.
 - It then extends from suprasternal notch to the mastoid processes on each side.
 - It is used when a *detailed study of neck organs is required, like in hanging or strangulation*^Q.
- **T-shaped or 'bucket handle' incision:**
 - A transverse incision in the neck is opened from acromion to acromion process (bisacromial) along the line of clavicles.
 - Then a single midline incision is made down the anterior body wall, avoiding the umbilicus, to pubis.
- **X-shaped incision:**
 - This incision is made over the back (incision extends from one side acromion to opposite side gluteal region)
 - To demonstrate the deep bruises in *custodial death cases*.

References:

1. Essentials of Forensic Medicine & Toxicology, by KS Narayan Reddy, OP Murty (35th edition).
2. Review of Forensic Medicine & Toxicology: Including Clinical and Pathological Aspects, by Gautam Biswas, 5th edition.

Techniques of Autopsy

Virchow's Technique
<ul style="list-style-type: none"> ● Individual organs removed one by one^Q ● Anatomical relations not preserved
Ghon's Technique
<ul style="list-style-type: none"> ● Organ blocks^Q & organ dissection ● Cervical, thoracic, abdominal and urogenital system are removed as organ block (separate blocks)
Lettulle's Technique
<ul style="list-style-type: none"> ● Cervical, thoracic, abdominal and pelvic organs are removed as en-masse^Q (all together) and organ dissection ● Anatomical relationships preserved and can be studied ● Rapid technique
Rokitansky's Technique
<ul style="list-style-type: none"> ● In situ dissection^Q of organs ● Fetal brain dissection^Q ● Infectious diseases, like HIV, Hepatitis B ● Radiation hazards^Q

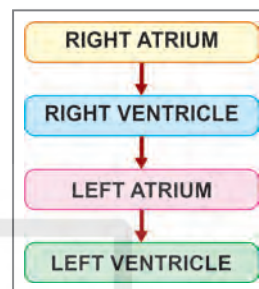
Important Individual Organ Dissection

- Hollow structures, such as blood vessels and GI tract (esophagus, stomach and intestines) is cut opened in order to reveal the pathology present inside.
- For solid organs, many parallel cuts, in a fashion similar to slicing a loaf of bread (**'bread-loafing'**) is done.

Heart Dissection: Inflow Outflow Method^Q

- Following the direction of blood flow.

- First, the right atrium is opened, followed by the tricuspid valve, and then the pulmonic valve.
- Next, the left atrium is opened, followed by the mitral valve and the aortic valve.



Brain

- In most autopsies, **the brain is examined in the fresh state**^Q.
- In select cases, the brain is 'fixed' and then examined.
- The **best routine fixative is 10% formalin**^Q and requires 2-3 weeks for *satisfactory fixation*.
- In fetuses and infants, *acetic acid to be added* to the fixative solution

Spinal Cord

- **Routinely spinal cord is not opened**^Q.
- In cases of suspected spinal injury, spinal cord is opened by **posterior approach**^Q.

Posterior approach	Anterior approach
Best approach ^Q	Simple and quick; and does not require turning the body over
Easy exposure of the uppermost cervical spine and allows direct visualization of the craniocervical junction; <i>Thus recommended in cases in which neck injuries are suspected</i> ^Q	<i>Nerve roots, dorsal ganglia and peripheral nerve can be visualized</i> ^Q .

Removal of Skull in Infants

- In fetuses and infants, removal of skull is different from that of adult; as the sutures are not closed and skull bones are soft.

Beneke's technique	Modification of Beneke's method
<p>Beneke's technique The skull and dura are cut parallel to the midline from the lateral edge of the anterior fontanelle</p>	<p>In a modification of Beneke's method the skull is incise lightly along the cranial sutures and at the fontanelles</p>



MULTIPLE CHOICE QUESTIONS

1. Match the timeline of the following events after death: (INI-CET July 2021)

- a. Relaxation of sphincter I. 5-10 days
b. Marbling II. 1-2 weeks
c. Adipocere III. 1-3 days
d. Liquefaction IV. Within 24 hours
1. A II, B I, C IV, D 1 2. A III, B II, C I, D IV
3. A IV, B III, C II, D 1 4. A I, B IV, C III, D II

2. In a case of RTA, the dead body showed spasm of group of muscles immediately after death. In which of the following condition, primary relaxation is not seen? (FMGE Dec 2020)

- a. Heat stiffening b. Cold stiffening
c. Cadaveric spasm d. Rigor mortis

3. Cherry red-colored PM lividity is associated with poisoning by (FMGE June 2021)

- a. Hydrogen sulfide b. Hydrocyanic acid
c. Carbon monoxide d. Nitrites

4. Rigor mortis first seen in (Recent Question 2019)

- a. Eyelids b. Heart
c. Limbs d. Neck

5. Which option is correct? (AIIMS Nov 2019)

- a. Rockitansky – in situ b. Virchow – en masse
c. Ghon’s – en bloc d. Letulle – one by one
a. a and c are correct b. a, b, c are correct
c. b and d correct d. a, b, c, d are correct

6. During cranial autopsy, facial incision is started at:

- a. At occiput b. Behind the ear lobe
c. In front of the ear lobe d. At vertex

7. A patient died due to jaundice. What will be the color of corpse after embalming?

- a. Grey b. Green
c. Yellow d. Brown

8. While performing embalming, difficulty encountered due to arterial system problem. How should the embalming fluid be introduced to overcome this problem?

- a. Low pressure high flow b. Low pressure low flow
c. High pressure high flow d. High pressure low flow

9. Heat rigor occurs due to:

- a. Coagulation of proteins
b. Heat hyperpyrexia
c. >65°C Burn
d. Heat stroke
e. Heat cramp

10. Which of the following is not used as a preservative in chemical analysis?

- a. Glycerin b. Formalin
c. Rectified spirit d. Salt solution

11. Forensic entomology: (Recent Question 2016)

- a. Study of insects b. Study of poisons
c. Study of death d. Study of snakes

12. Which of the following is NOT correct about postmortem changes?

- a. Post- mortem lividity fixes at 6-8 hours
b. Rigor mortis occurs when ATPs decrease up to 85% of normal
c. Rigor mortis is delayed in cholera and strychnine poisoning
d. Cadaveric spasm is instantaneous at the time of death
e. Postmortem caloricity occurs after 5-6 hours of death

13. True about pugilistic attitude is?

- a. Indicates only antemortem burn
b. Indicates only postmortem burn
c. Cannot differentiate between antemortem and postmortem burn
d. Occurs due to intense heat
e. Indicate defense by victim during antemortem death

14. All of the following is true about Kevorkian sign, except:

- a. Persists even after 3 years of death
b. Appears within minutes of death
c. Visualized using ophthalmoscope
d. Cattle tracking sign

15. Tache noire: (Recent Question 2016)

- a. Deposition of dust in sclera
b. Decrease in body temperature after death
c. Muscle stiffening after death
d. Staining after death

16. Postmortem caloricity is not seen in: (Recent Question 2015)

- a. Strychnine poisoning
b. Typhoid
c. Organophosphorus poisoning
d. Septicemia

17. Which is the first organ to putrefy?

(Recent Question 2018)

- a. Brain b. Heart
c. Prostate d. Kidney

18. What is the smell of mummified body?

(Recent Question 2018)

- a. Odorless b. Putrid
c. Pungent d. Offensive

19. Adipocere occurs in:

(Recent Question 2016)

- a. Arsenic poison
b. Body lying in water
c. Body inside car locked doors
d. Inside shallow soil

20. Suitable environmental conditions for mummification:

(Recent Question 2016)

- a. Lying in water b. Inside shallow soil
c. Dry and hot air d. Under earth

21. Postmortem examination stomach incision done after:

(Recent Question 2018)

- a. Double ligation b. Single ligation
c. Cut open d. Triple ligation



ANSWERS WITH EXPLANATIONS

1. Ans. 3. (A IV, B III, C II, D I)

[Ref: Essentials of Forensic medicine, Dr KS Narayana Reddy, 33th Edition, P: 137, 161]

- Primary flaccidity (relaxation of sphincters) - <24 hours
• Cadaveric spasm- immediately after death
• Marbling - 36- 72 hours
• Adipocere - 3 d - 3m
• Mummification - 3m- 12 m
• Liquefaction of tissues- 5-10 days
• Livor mortis - 30 minutes (onset) & 6-12 hours (max appearance)

2. Ans. c. Cadaveric spasm

Review of Forensic Medicine and toxicology by Gautum Biswas, 5th edition, Page no 160

- The dead body showing spasm of group of muscles immediately after death, without primary relaxation.
• This is indicative of cadaveric spasm.

Rigor mortis - ATP depletion^Q
Cadaveric spasm - unknown mechanism^Q
Heat stiffening - Muscle protein coagulation^Q
Cold stiffening - Solidification of fat^Q

3. Ans. C. Carbon monoxide

[Ref: Reddy 30th/e p. 144]

- Cause of Death (Poisonings) can be determined by the color of PM staining.

Table with 2 columns: Substance and Color. Includes Normal (Blue purplish), Carbon monoxide (Cherry red), Cyanide (Bright Red/Brick red^Q), Hypothermia/Refrigeration (Pink), Nitrate/Potassium chlorate (Chocolate Brown), Septic abortion (Bronze), Hydrogen sulfide (Bluish Green), Aniline (Brown/deep blue).

4. Ans. b. Heart

[Ref: Essentials of Forensic medicine, Dr KS narayana Reddy, 33th Edition, P: 161]

Nysten's rule:

- It first appears _in involuntary muscles; the myocardium becomes rigid in an hour. Then it develops in eyelids, neck and lower jaw and passes upwards to the muscles of the face, and downwards to the muscles of the chest, upper limbs, abdomen and lower limbs and lastly in the fingers and toes

5. Ans. a. a and c are correct

[Ref: Reddy 30th/e p. 96-98] Refer theory discussion

Techniques of organ removal

- Virchow: Organ by organ (most common)
• Lettule's: En masse (Quicker; Anatomical relationships can be studied)
• Ghon's: En bloc
• Rokitansky: In situ dissection (preferred for infectious diseases)

6. Ans. b. Behind the ear lobe

[Ref: KSN Reddy, Essentials of Forensic Medicine & Toxicology, 33rd Ed., P. 116]

Scalp incision: A coronal incision is made in the scalp, which starts from the mastoid process just behind one ear. It is carried over the vertex of the scalp to the back of the opposite ear (intermastoidal incision). The scalp is reflected forward and backward.

7. Ans. b. Green

8. Ans. d. High pressure, Low flow

[Ref: earlier discussion]

In embalming of jaundice cases, the formaldehyde-based solutions converts the bilirubin in the body into biliverdin and the color changes into green.

9. Ans. a. Coagulation of proteins c. >65°C (refer earlier discussion)

10. Ans. b. Formalin

High Yield Data

[Ref: Parikh 6th/e p. 2.62; Sumit Seth's 2nd/e p. 158]

Preservatives used

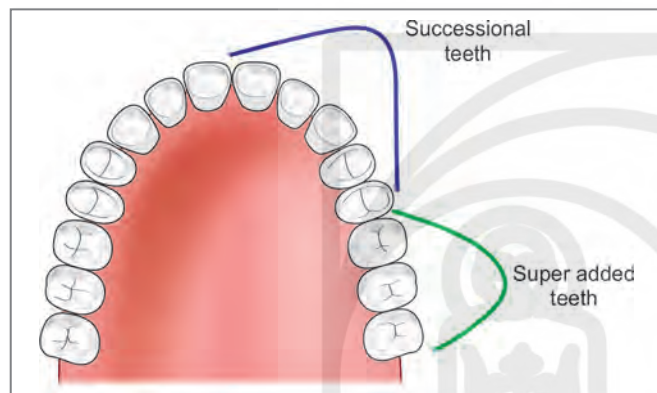
Table with 6 columns: Saturated solution of common salt, Rectified spirit, Rectified spirit contraindicated in, Sodium flouride is used in, Preservative not required in, Virological study. Each column contains specific details about preservative use in forensic medicine.



Period of Mixed Dentition

- The permanent dentition starts with first Molar by 6 years.
- As the permanent teeth erupts, it replaces the existing temporary teeth one by one.
- During that process, both the **temporary teeth and permanent teeth present in the oral cavity** between **6 years and 11 years** – Period of mixed dentition

Two Sets of Teeth in Permanent Dentition



Superadded teeth

- Teeth which don't have deciduous predecessors
- All *permanent molars*^Q
- 12 in number^Q

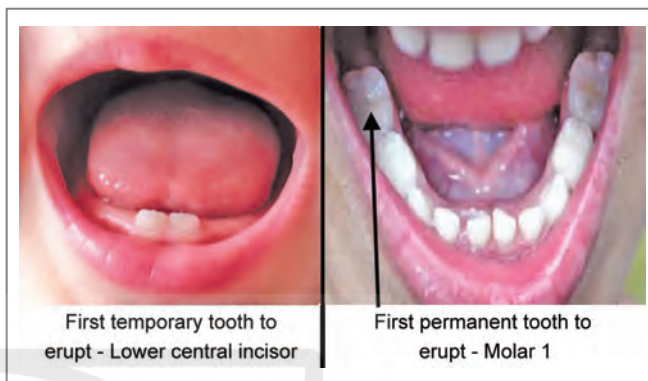
Successional teeth

- Teeth which erupt in the place of deciduous teeth
- Permanent incisors, canines and premolars
- 20 in numbers^Q

Chronological Sequence of Permanent Dentition Eruption

Age	Erupting teeth	Total no of teeth in the oral cavity
6–9 months	Temporary incisors	8
12 months	Temporary 1 st molar	12
18 months	Temporary canine	16
24 months	Temporary 2 nd molar	20
6 years ^Q	Permanent 1 st molar (<i>First</i>) ^Q	24 ^Q (4 P + 20 T) ^Q
7 years	Permanent central incisors	24 ^Q (8 P + 16 T)
8 years	Permanent lateral incisors	24 ^Q (12 T & 12 P) ^Q
9 years	Permanent 1 st premolar	24 ^Q (8 T & 16 P) ^Q
10 years	Permanent 2 nd premolar	24 ^Q (4 T & 20 P)
11 years	Permanent canine	24 ^Q
12 years	Permanent 2 nd molar	28
17–25 years	Permanent 3 rd molar (<i>Last</i>) ^Q	32

Formula to calculate total number of permanent teeth in oral cavity from age
 No. of permanent teeth = (Age in years – 5) × 4



High-Yield Info

Dental eruption

- Temporary dentition starts at 6 months of age.
- Temporary dentition gets **completed at 2 years of age**^Q.
- No premolars in temporary dentition
- Permanent dentition starts at **6 years of age** (1st Molar^Q).
- From the age of 6–11 years, the total number of teeth in the jaw is 24. Because, the erupting successive teeth replaces all the temporary teeth one by one.
- Temporary molars are replaced by permanent premolars.
- **Delayed dentition:** Rickets^Q and ill-nourished children; **early eruption:** Syphilis.
- **Period of mixed dentition**^Q: Between the age of 6 and 11 years, both temporary and permanent teeth are seen in the jaw.
- The **Last temporary tooth** to fall is **canine**

(Note: Dear friends, questions are often asked about the total number of teeth at specified age. Irrespective of age between 6 and 11 years, the total number of teeth is 24)

Other Methods of Age Estimation from Teeth

Boyde's Method

- Based on **incremental growth lines**^Q in tooth.
- Neonatal line is noted in about 3 days (electron microscope) to 3 weeks (simple microscope).
- Age is calculated by **counting the number of lines from the neonatal line**^Q.
- Useful to estimate the age of a **dead infant**.
- Age can be determined in **terms of days**^Q.

Stack's Method

- Age is estimated from the height and **weight of the erupting tooth**^Q.
- Used in **fetus and infants**^Q

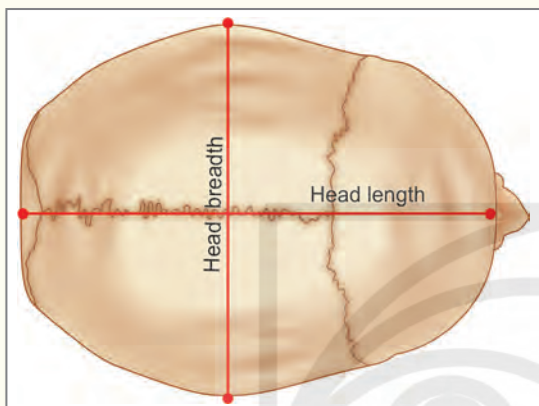
Gustafson's Method

- Age estimation of adults >21 years
- Depends on the **secondary changes in the teeth**
- *Anterior teeth are more reliable than posterior* (incisors more reliable^Q than premolars)
- *3rd molar is unsuitable* for Gustafson's method



IMAGE-BASED QUESTIONS

1. Cephalic Index of 80-85 is seen in which of the following race?



- a. Mongols
- b. Chinese
- c. European
- d. Negroid

2. The minimum age of the given X-ray is:



- a. 12 years
- b. 15 years
- c. 6 years
- d. 18 years

3. The minimum age of the given X-ray is:



- a. 12 years
- b. 14 years
- c. 18 years
- d. 20 years

4. The minimum age of the given X-ray is:



- a. 12 years
- b. 14 years
- c. 16 years
- d. 18 years

5. The minimum age of the given X-ray is:



- a. 12 years
- b. 16 years
- c. 18 years
- d. 20 years

6. The minimum age of the given X-ray is:



- a. 9 years
- b. 6 years
- c. 16 years
- d. 11 years



ANSWERS WITH EXPLANATIONS TO IMAGE-BASED QUESTIONS

1. Ans. a. Mongols

Dolichocephalic	Long headed	Aryans, Negroes	70–74.9
Mesaticephalic	Medium headed	Europeans & Chinese	75–79.9
Brachycephalic	Short headed	Mongoloids	80–84.9

2. Ans. d. 18 years

- In the given X-ray, the centers for carpal bones appeared.
- Ossification Center for lower end of radius & ulna appeared & fused.
- The age for fusion of radius center is 18 years.
- The minimum age of the person must be 18 years.

3. Ans. d. 20 years

- In the given X-ray, the last center, i.e., ischial tuberosity has appeared & fused.
- Hence, the minimum age is 20 years.

4. Ans. d. 18 years

In the given X-ray

- The ossification center for iliac crest & ischial tuberosity has appeared.
- The head of femur, great trochanter & lesser trochanter has fused with the shaft of femur.
- Iliac crest center has not fused.

5. Ans. a. 12 years

In the given X-ray

- The ossification center for lesser trochanter (12 years) has appeared.
- Triradiate cartilage has not fused. (15 years)
- Hence, the minimum age of the person is 12 years.

6. Ans. c. 16 years

- In the given X-ray, all the ossification centers around the elbow have appeared and fused.
- Hence, the minimum age of the X-ray is 16 years.

7. Ans. d. 11 years

- In the given X-ray, the centers for head of radius, capitulum, trochlea, olecranon process have appeared.
- The minimum age of the person must be 11 years.

8. Ans. d. Large parietal eminence

Important Features of female skull

Prominent glabella, supraorbital ridges, prominent zygoma, square-shaped orbit, square-shaped chin, prominent mental tubercle, less prominent frontal and parietal eminences.

9. Ans. d. Sacrum long & narrow.

- The displayed pelvis shows circular pelvic inlet, sub-pubic angle more than 90°, sacrum short & wide, which are suggestive of female sex.

10. Ans. d. Smooth frontonasal angle, round-shaped orbit, prominent frontal eminences – Female

Important Features of female skull

- Large Frontal eminence
- Large Parietal eminence
- Rounded orbits with Sharp margin
- Vertical Forehead
- Smooth Frontonasal junction

11. Ans. b. Female

- Female pelvis shows characteristic wide & shallow greater sciatic notch

12. Ans. a. Francis Galton

Francis Galton	Dactylography
Locard	Poroscopy, Exchange principle
Krogman	Accuracy of Sex determination from bones
Orfila	Father of modern toxicology, Father of forensic psychiatry

- Francis Galton systematized the fingerprint systems

13. Ans. b. Poroscopy

14. Ans. d. Cheiloscopy

15. Ans. b. Rugoscopy

16. Ans. b. Podography

17. Ans. c. Superimposition

Dactylography	Identification from fingerprints
Poroscopy	Identification from the arrangement of sweat pores in fingerprint ridges
Rugoscopy	Identification from rugae in hard palate
Cheiloscopy	Identification from lip prints
Podography	Identification from footprints
Superimposition	Identification from skull & photograph

18. Ans. b. Dactylography

- Fingerprints will be different even in monozygotic twins
- Chances of two persons having identical prints is 1 in 64 billion

19. Ans. d. Laser

- Laser is not used to demonstrate faint tattoos.

20. Ans. d. It becomes tough and glistening in two weeks

Age of Scars:

- Five to six days - reddish or bluish “angry” scar.



NEXT/CLINICAL CASE-BASED QUESTIONS

1

CBO

As per POCSO Act, a child was brought for age estimation. X-ray of wrist was taken. The age of this wrist joint is: (Recent Question 2020)

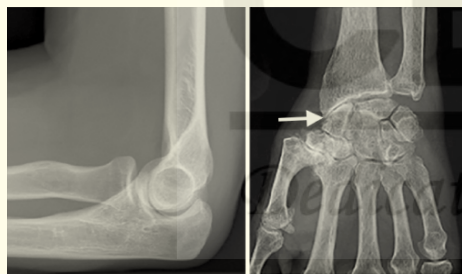


- a. 4 years
- b. 7 years
- c. 10 years
- d. 13 years

2

CBO

A 14-year-old female was claimed to be kidnapped, on interrogation she claims that she is not a minor and left home with the person on her own will. Court ordered for her age estimation. Given below are the X-ray of pelvis, wrist and bilateral elbow. What is her most probable age based on these? (PGI May 2018)



- a. 14 years
- b. 16-17 years
- c. 17-19 years
- d. 21-22 years

3

CBO

A missing complaint of a person was filed 1 week back. He was last spotted near the forest area. Police found one male skeleton in the forest. Which of the following are features of male pelvis? (INI-CET Nov 2021)

- a. Small triangular obturator foramen
- b. Large and wide acetabulum
- c. Inverted ischial tuberosity
- d. Subpubic angle less than 80
- e. Greater sciatic notch is wide and shallow

4

CBO

Tattoo is not visible on autopsy. But the presence of tattoo was informed by relative. What is the next site to check? (Recent Question 2020)

- a. Regional lymph node
- b. Liver
- c. Skin
- d. Vessel

5

CBO

A person who has committed a crime has been brought before the court of law by the police. The court may direct the police to take him to the Juvenile court, if his age is: (FMGE June 2021)

- a. 17 years
- a. 19 years
- b. 20 years
- c. None of the above

6

CBO

A bunch of skeletal remains was recovered during digging of a construction site. The bones were sent for expert opinion to a medicolegal expert. The doctor also examined the skull. He noticed that the base of his sphenoid was not yet fused with the occiput. The expected age of the skull should be:

- a. <21 years
- b. <30 years
- c. <35 years
- d. <45 years

7

CBO

A boy, who got involved in a case of robbery, was brought for age estimation to the forensic medicine department. The examination of teeth revealed delayed tooth eruption, enamel hypoplasia, micrognathia, and anterior open bite. In all of the following conditions, dentition is delayed; except:

- a. Rickets
- b. Hypothyroidism
- c. Malnutrition
- d. Congenital Syphilis

8

CBO

A newborn baby found dead near a lake, was brought for medicolegal autopsy. During autopsy, the doctor examined the ossification centers to find out the gestational age. The doctor thus understands that the fetal growth had been normal till full term. Which epiphysis appearance is most likely expected?

- a. Lower end of femur
- b. Upper end of humerus
- c. Lower end of fibula
- d. Upper end of tibia



MULTIPLE CHOICE QUESTIONS

1. **The identification features of a female skull are:** (INI-CET July 2021)
 1. Smaller & smooth mastoid
 2. Smooth glabella
 3. Round eye orbits
 4. Zygomatic bone prominence
 5. Heavy mandible
 6. Prominent frontal and parietal eminence

a. 1, 3, 6, 4 b. 1, 2, 3, 6
c. 1, 3, 5, 6 d. 1, 2, 4, 5
2. **Match the bone age estimation:** (INI-CET July 2021)
 1. Sacrum body fusion. I. 18- 20 years
 2. Medial end of clavicle II. 50-60 years
 3. Lambdoid suture III. 12-18 months
 4. Metopic suture fusion IV. 22 - 25 years

a. 1-IV, 2-I, 3-II, 4-III b. 1-I, 2-II, 3-III, 4-IV
c. 1-II, 2-III, 3-IV, 4-I d. 1-II, 2-IV, 3-II, 4-II
3. **Match the best pair:** (INI-CET Nov 2021)
 1. Celiac disease I. Complete atrophy of epidermal ridges
 2. Radiation II. Partial atrophy of epidermal ridges
 3. Scleroderma III. Irreversible change in epidermal ridges
 4. Dermatitis IV. Epidermal ridge thickening

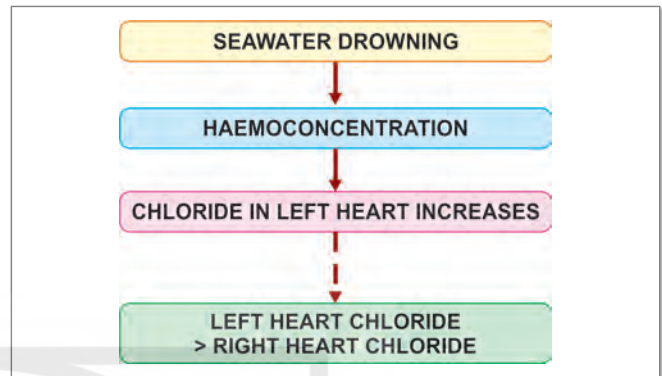
a. 1-IV, 2-III, 3-II, 4-I b. 1-I, 2-III, 3-IV, 4-I
c. 1-III, 2-II, 3-I, 4-IV d. 1-II, 2-I, 3-III, 4-IV
4. **Which of the following is best to determine sex in a 12-year-old child?** (FMGE Dec 2020)
 - a. Skull
 - b. Hip
 - c. Femur
 - d. Mandible
5. **First tooth to appear is:** (FMGE June 2021)
 - a. Lower central incisor
 - b. Upper central incisor
 - c. First molar
 - d. None
6. **X-ray showing fusion of sternal body segments and fusion of medial end of clavicle. The approximate age is:** (INI-CET Nov 2020)
 - a. > 15 years
 - b. > 18 years
 - c. > 22 years
 - d. > 25 years
7. **First carpal bone to ossify:** (Recent Question 2019, AIIMS 2017)
 - a. Scaphoid
 - b. Lunate
 - c. Capitate
 - d. Pisiform
8. **Cephalic index in Indian population is:** (Recent Question 2018)
 - a. 60-70
 - b. 70-75
 - c. 75-80
 - d. 80-85
9. **When does basioccipital fuse with basisphenoid?** (Recent Question 2018)
 - a. 12-14 years
 - b. 18-21 years
 - c. 22-25 years
 - d. 25-30 years
10. **Locard's principle is famous for:** (Recent Question 2018)
 - a. Theory of exchange
 - b. Fingerprint study
 - c. Formula for estimation of stature
 - d. System of personal identification using the body measurement
11. **Haase's rule is for:** (Recent Question 2016)
 - a. Fetal age
 - b. Fetal sex
 - c. Race
 - d. Height
12. **In a fingerprint reader (FINDER), prints of eight fingers are recorded excluding:** (AIIMS 2016)
 - a. Thumb
 - b. Middle finger
 - c. Ring finger
 - d. Little finger
13. **The skeletal remain in a building was suspected to be of a male, the length of humerus is 24.5 cm. The stature of the person will be:** (AIIMS 2016)
 - a. 130.095 cm
 - b. 93.59 cm
 - c. 143.00 cm
 - d. 110.00 cm
14. **Following mass disasters, best way to identify bodies is:** (Recent Question 2016)
 - a. Dental
 - b. Clothing
 - c. X-rays
 - d. None of these
15. **According to FDI, the left lower canine is designated as:** (Recent Question 2016)
 - a. 32
 - b. 33
 - c. 42
 - d. 43
16. **Which of the following is not correct regarding teeth features and ethnicity?** (AIIMS 2017)
 - a. Upper third molar is most commonly absent in Mongolians
 - b. In negroes, the cusps of molars are wide and deep and shovel-shaped cusps in incisors
 - c. Caucasians have Carabelli cusps
 - d. More cusps in Negroids
17. **Which of the following is correct regarding corporobasal index of sacrum?** (AIIMS 2017)
 - a. Breadth of first sacral vertebra X 100/breadth of fifth lumbar vertebra
 - b. Breadth of fifth lumbar vertebra X 100/breadth of all sacral vertebra
 - c. Breadth of first sacral vertebra X 100/breadth of base of sacrum
 - d. Breadth of fifth lumbar vertebra X 100/breadth of base of sacrum
18. **Sternal index is for:** (Recent Question 2016)
 - a. Age determination
 - b. Sex determination
 - c. Species identification
 - d. None of these



- Presence of diatoms in the distant tissues like **bone marrow of femur**^Q (best site for analysis) is the proof of **antemortem drowning**
- Diatoms test is *useful even in decomposed bodies*^Q as diatoms resist putrefaction^Q
- The test is *negative in dead bodies thrown into water and in dry drowning*^Q.

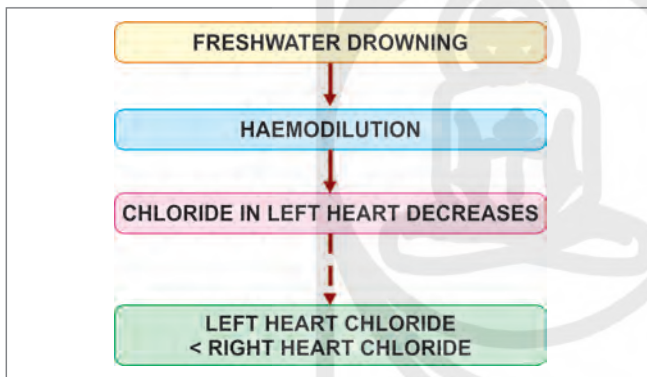
Gettler Test

- Based on **chloride content**^Q of blood in heart chambers
- Normally, the chloride content of the right and left side of heart is nearly same, about 600 mg/100 mL.
- If the *difference is 25 mg% or more, it is suggestive of antemortem drowning.*
- In freshwater drowning, chloride reduces by 50% in left ventricle
- In seawater drowning, chloride increases by 30–40% in left ventricle



No change in chloride content of heart:

- Drowning due to laryngeal spasm or vagal inhibition
- Putrefaction
- Patent foramen ovale



MNEMONIC

Ms Dhoni – Great Cricketer, Entertainer and Finisher

SIGNS OF ANTEMORTEM DROWNING

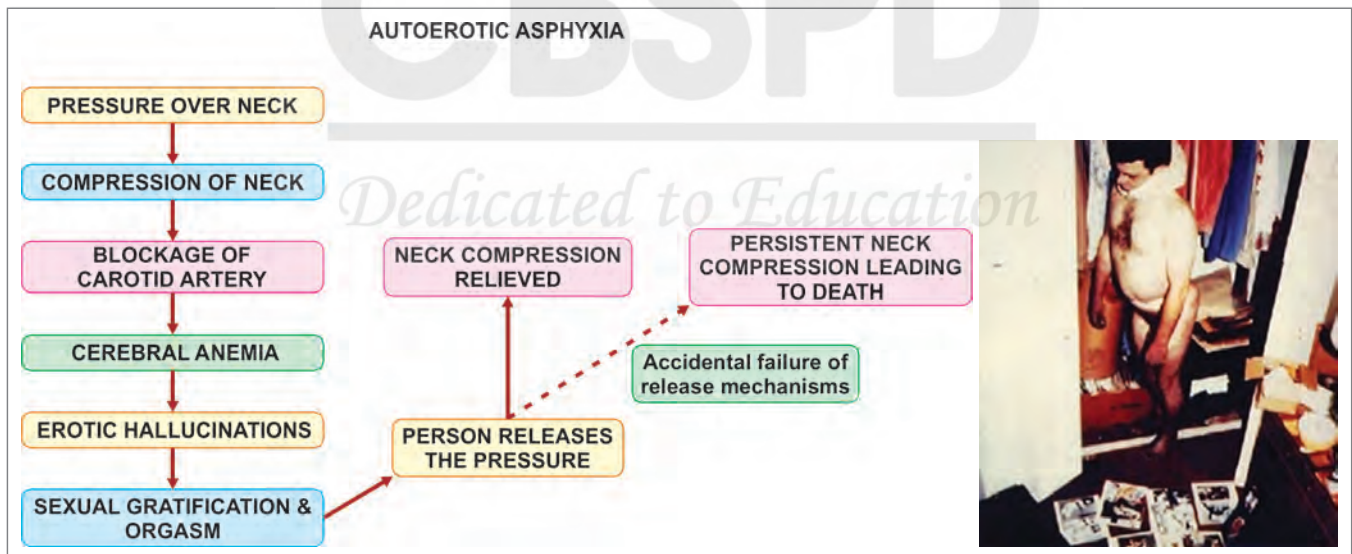
- M** – Mud particles in airway
- D** – Diatoms positive in bone marrow
- C** – Cadaveric spasm
- G** – Gettler’s test positive
- E** – Emphysema aquosum
- F** – Froth in mouth

Forensic Riddle

“A cold hand tightly clenched froth spilt unto his face, wreathing on the part of the indicted, it is clear the deceased under water, was breathing”.

SEXUAL ASPHYXIA/AUTOEROTIC ASPHYXIA/HYPOXIPHILIA/ASPHYXIPHILIA/KOTZWARRISM

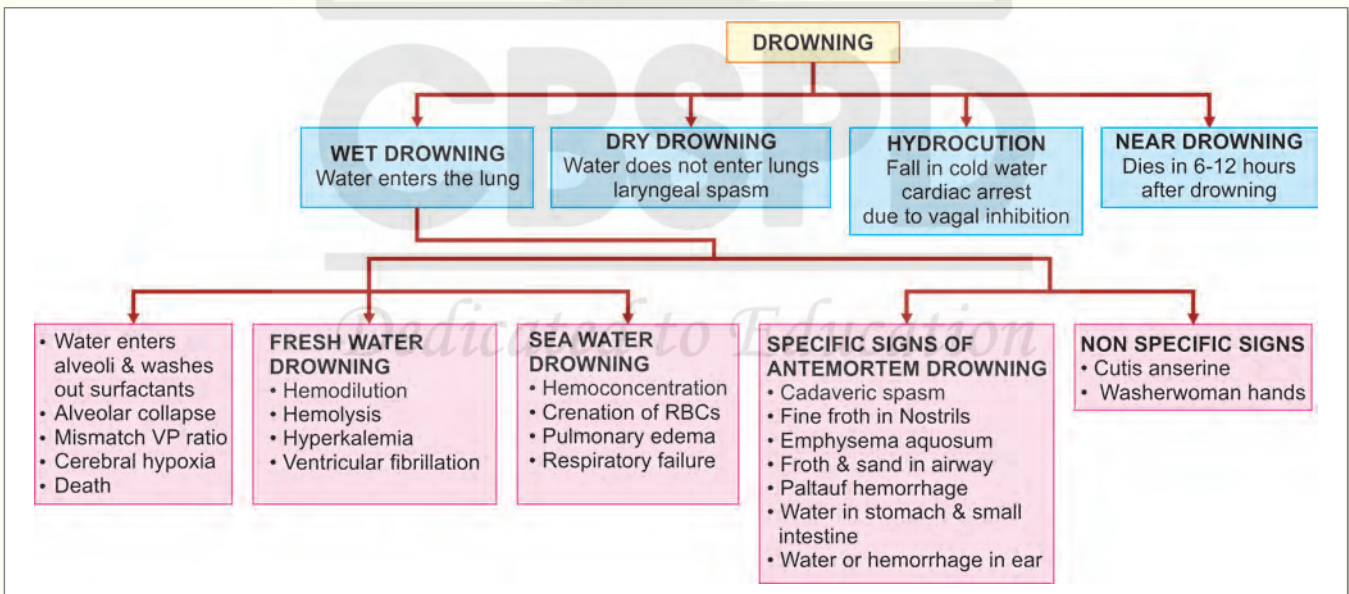
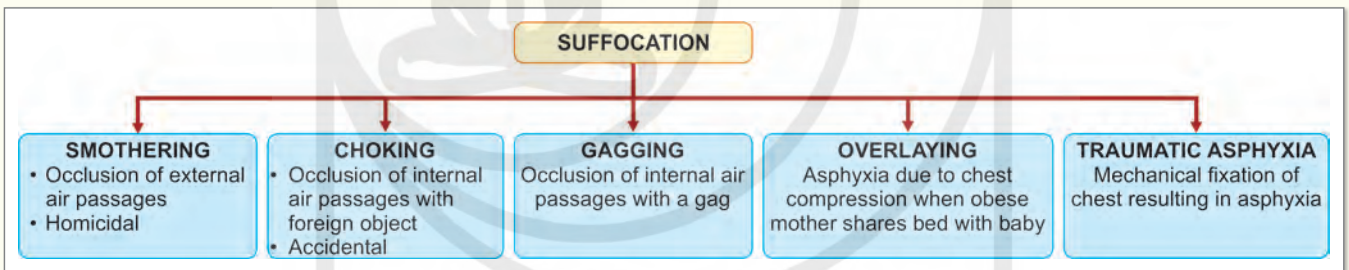
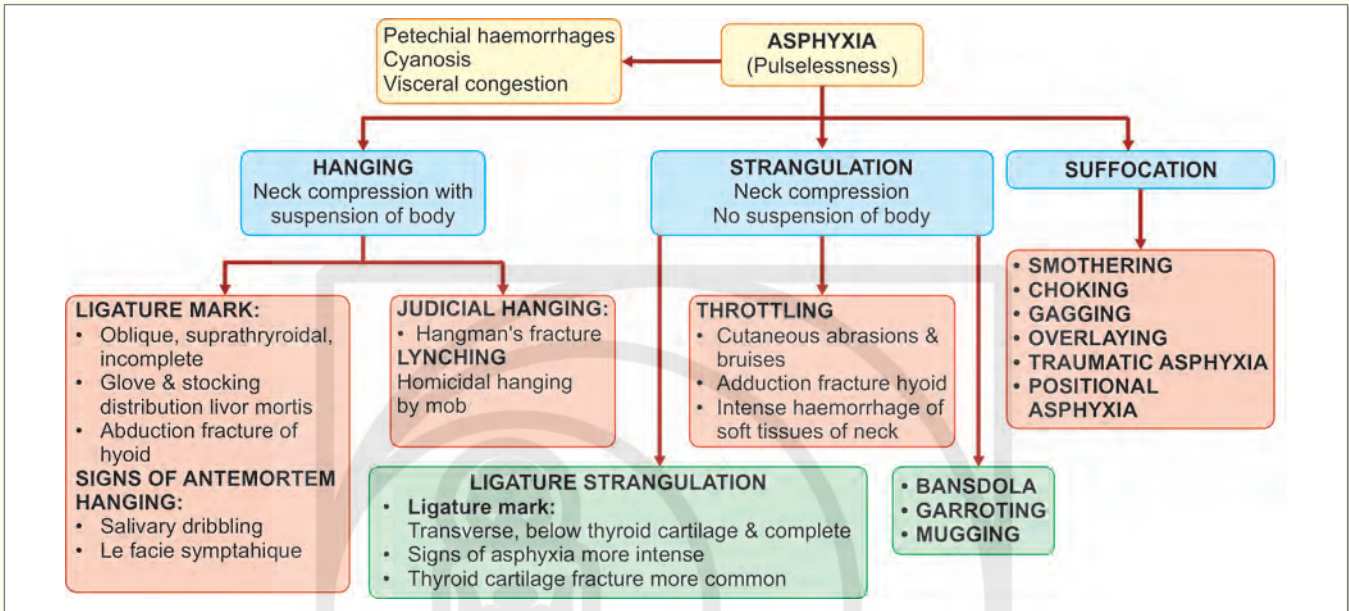
- Autoerotic asphyxia is a *paraphilia* in which sexual arousal and orgasm depend on *self-induced asphyxia*.





CHAPTER AT A GLANCE

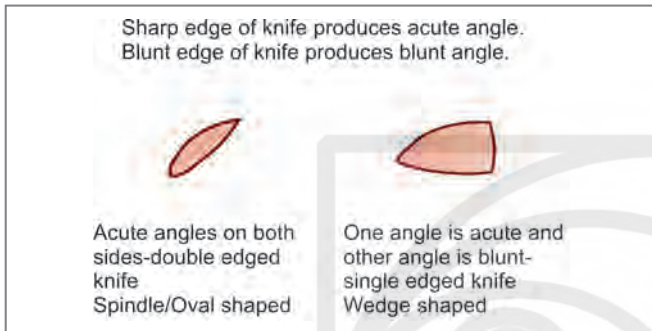
Theory





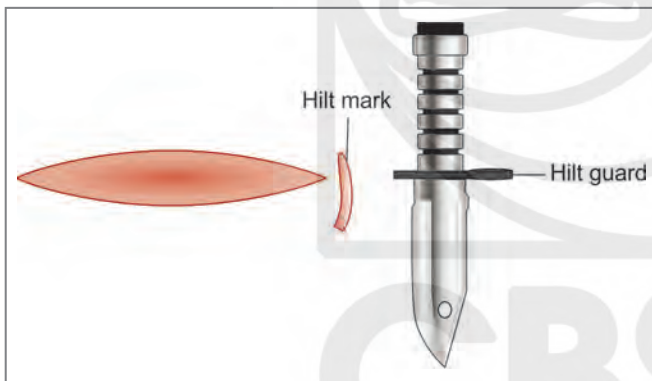
Shape of Stab Wound

- Single-edged weapon - Wound will be triangular or *wedge-shaped*^Q (one angle of the wound will be sharp and the other rounded, blunt or squared off)
- Double-edged weapon - Wound will be elliptical or *slit-like*, and both angles will be sharp^Q.



'HILT MARK' INJURIES

- Hilt marks are the abrasions/contusions produced by *the hilt guard of the knife* during full penetration into the body.
- **Direction of the force**^Q can be determined by the location of hilt mark.



LANGER'S LINE OR CLEAVAGE LINES

- The **pattern of collagen fiber**^Q arrangements are the lines of cleavage of the skin and their linear representations are known as "Langer's line of cleavage".
- Lines of Langer determine the **Gaping**^Q of stab injury.
- An incised/stab wound at right angles to the cleavage lines - gaping will be more.
- An incised/stab wound that *runs parallel to these lines* - gaping will be less^Q and slit-like shaped.



Tailing:

- Seen in *incised wound*^Q.
- Direction of force can be determined

Swallow tails:

- Seen in laceration.
- Small uneven tears at angles diverging from the main laceration.

Fish tailing:

- Seen in **stab injury**^Q.
- Small splits from the blunt end of the stab wound.
- Produced during withdrawal of knife or the blunt end of knife.

DEFENSE/PROTECTIVE WOUNDS

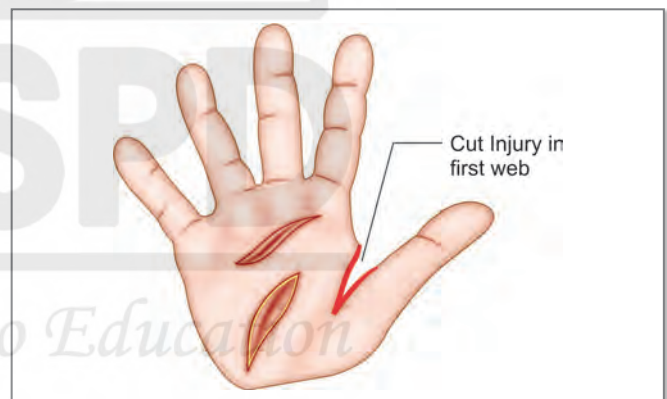
- It results from **victim's spontaneous instinctive reaction**^Q toward self-protection.
- If the weapon is blunt, bruises and abrasions are produced.
- If the weapon is sharp, the injuries will depend upon the type of attack, whether stabbing or cutting.
- The presence of defense wounds indicate **homicidal nature**^Q of the injuries.

Active Defense Injuries

- They are seen when the victim tries to grasp the weapon.
- Location: palms, the flexor sides of the fingers and the interdigital spaces, more common in the web between the thumb and index finger.

Passive Defense Injuries

- These are seen when the victim raises the hands or arms for protection.
- Location: Ulnar surfaces of forearms, wrists, knuckles and the back of the hands



Defense wounds are absent if the victim is:

- Attacked from behind
- Unconscious
- Under the influence of alcohol/drugs
- Taken by surprise



HARAKIRI (SEPPUKU)

- It is an unusual type of **suicidal^Q stab injury** and disembowelment.
- Practiced by Japanese Samurai warriors.
- A single large abdominal stab wound is inflicted by a short sword on the left side, drawing the blade across to the right side and then turning it upwards producing an L-shaped cut.

- It results in immediate death by **sudden evisceration^Q** of the internal organs and circulatory collapse.

Concealed punctured wounds:

- Punctured wounds on the *concealed parts of body*
- **Sites:** Nostrils, fontanel, inner canthus of eyes, axilla, vagina, rectum and the nape of the neck.
- Fatal penetrating injuries without leaving any visible external marks or bleeding.

REGIONAL INJURIES

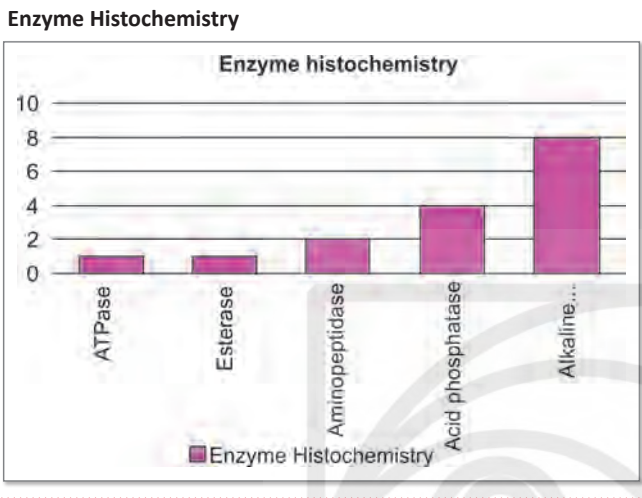
Types of Skull Fractures

Fractures of Skull Vault

Types of fracture	Causative force	Description
Fissure Fracture	<ul style="list-style-type: none"> • Blows with an agent having a relatively broad striking surface^Q 	<ul style="list-style-type: none"> • Due to general deformation of skull • Most common fracture^Q • Thin linear cracks passing over the vertex or base without any displacement of the fragments. • Difficult to detect, may not be seen on X-ray, and can only be detected at autopsy.
Depressed fracture (fracture ala signature)	<ul style="list-style-type: none"> • Heavy weapon with a small striking surface^Q • Example: Hammer, stone, chopper 	<ul style="list-style-type: none"> • Due to local deformation of skull. • A portion of fractured bone is depressed inwards into the cranial cavity • The fractured segment resembles the pattern of the striking surface of the weapon^Q. • It is also called 'fracture ala signature' (signature fracture)
Comminuted fracture	<ul style="list-style-type: none"> • It is often a complication of fissured or depressed fracture. 	<ul style="list-style-type: none"> • There are two or more fracture lines intersecting and dividing the bone into three or more fragments.^Q • When there is no displacement of fragments, it resembles a spider's web or mosaic.
Pond fracture (indented fracture)	<ul style="list-style-type: none"> • Obstetric forceps^Q 	<ul style="list-style-type: none"> • A simple dent in the skull without a fracture line. • The inner table is not fractured, but fissured fractures may occur in the outer table around the periphery of the dent. • Dura and brain are not damaged. • Occurring only in the skull of infants and children^Q due to pliability. • Also known as ping-pong fracture, as it looks similar to a dent in ping-pong ball.
Diastatic/sutural fracture	<ul style="list-style-type: none"> • Blunt injury to skull of young adults^Q 	<ul style="list-style-type: none"> • Separation of skull sutures^Q • Common in sagittal suture • Occurring in the skull of children and young adults.
Gutter fracture	<ul style="list-style-type: none"> • Oblique bullet wounds^Q 	<ul style="list-style-type: none"> • When a part of the thickness of the skull bone is removed so as to form a gutter/channel/trench. • It is usually accompanied by comminuted depressed fracture of the inner table of skull, and the fragments causing injury to the meninges and brain.
Perforating fracture	<ul style="list-style-type: none"> • Pointed sharp weapons like daggers, knives and axe 	<ul style="list-style-type: none"> • Both the tables are involved



Extra Edge



TRANSPORTATION INJURIES

Injuries due to road traffic accidents are of three types:

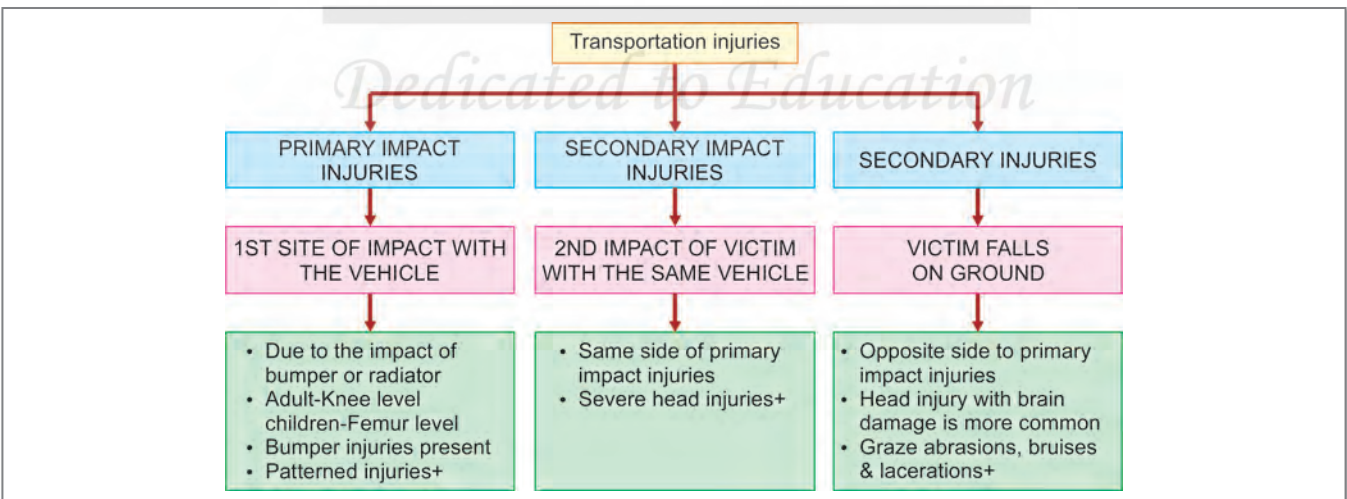
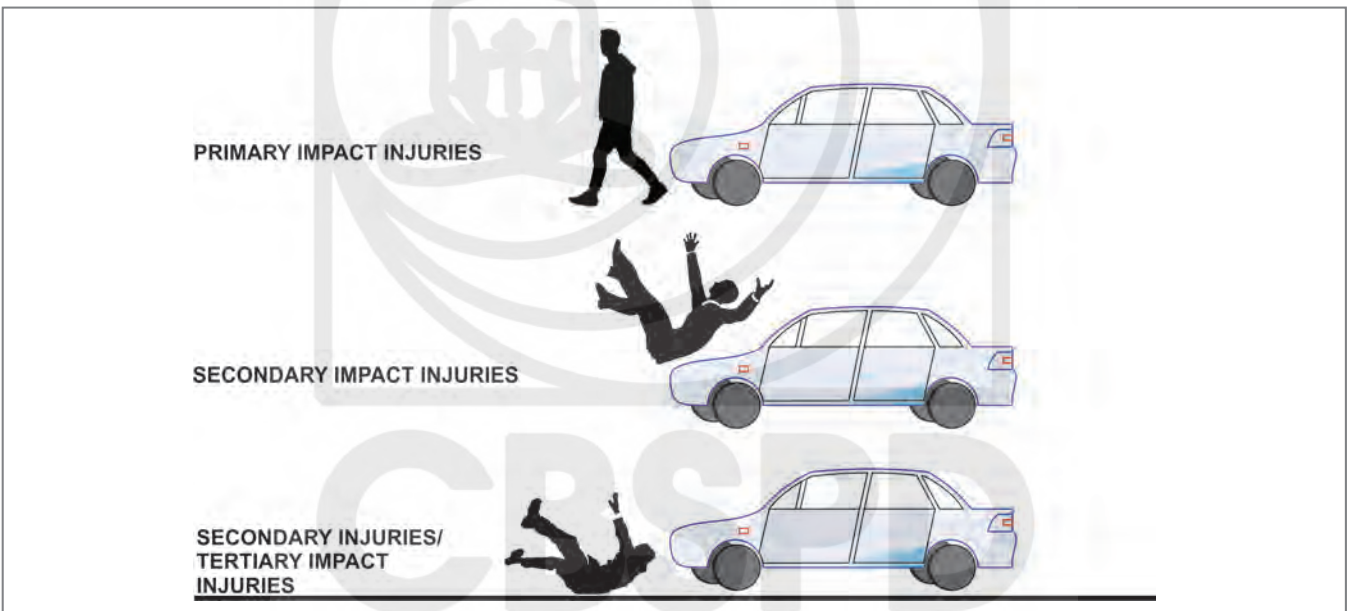
1. Pedestrian
2. Motor cyclist
3. Occupant of the vehicle

Injuries to Pedestrian

Usual sequence of the impacts with vehicle:

- First, the vehicle hits the person (first impact with vehicle).
- After the first impact, the victim is scooped off the ground and falls on the vehicle (second impact with vehicle).
- Then the victim is thrown on the ground.

Primary impact injuries	Secondary impact injuries	Secondary injuries/tertiary impact injuries
injuries caused by vehicle when it first struck the person	Injuries caused by second impact of victim and vehicle	Injuries sustained by a victim when falls on the ground





ANSWERS TO NEXT/CLINICAL CASE-BASED QUESTIONS

1. Ans. **b. Near shot**

The wound showing absence of burning (out of the range of flame) and presence of tattooing (inside the range of gunpowder) indicates the near shot.

2. Ans. **a. Extradural hemorrhage**

The period of consciousness between two unconsciousness is called lucid interval. It is primarily seen in extradural hemorrhage.

3. Ans. **c. Burns due to moist heat**

The burns showing soddened skin, with clear line of demarcation, lines of vesicles running down the body indicate scalds.

Typical features of scalds

- No charring & No singeing of hair
- Soddening of the skin
- Signs of splashing
- Lines of blisters
- Clothes are wet & intact

4. Ans. **a. Skin crushed between two hard objects**

The laceration in the forehead & back of head is split laceration. Split laceration is produced by skin crushing between bone & weapon.

5. Ans. **c. Hogtying**

It is the torture method, where the victim's ankle & wrist are tied in a prone position.

6. Ans. **a. Bradycardia**

In heat stroke, tachycardia is seen (not bradycardia)

7. Ans. **b. Flying missiles**

8. Ans. **d. Abrasion, bruise and fracture are triad of explosion**

In a bomb blast victim, the presence of multiple abrasions & lacerations injuries at right side chest & abdomen are suggestive of secondary blast injuries (due to flying missiles) Marshal's triad = Abrasion, Contusion & Laceration are seen on same side of the body (due to flying missiles).

9. Ans. **b. 2-3 days**

10. Ans. **b. Graze**

The image showing reddish brown scabbed abrasion, indicating 2-3 days.

11. Ans. **c. Homicidal**

The injuries on the victim are defense injuries, seen in homicide.

12. Ans. **b. Close shot entry wound**

The circular wound with erythema seen around the margin, blackening & tattooing is suggestive of close shot entry wound.

13. Ans. **b. 54%**

According to Rule of nine:

- Face = 18 %
- Both upper limbs = 9 + 9 %
- Front of chest = 9%
- Front of abdomen = 9%
- Total surface area of burns: 54 %

14. Ans. **d. Ectopic bruise**

Blackening with swelling and puffiness around her left eye following a trauma indicates black eye, a type of ectopic bruise.

15. Ans. **b. Depressed fracture.**

- Depressed fracture is due to local deformation of skull
- The fractured segment resembles the pattern of the striking surface of the weapon
- It is also called 'fracture ala signature' (signature fracture)

16. Ans. **d. Windscreen impact**

The description of the injury suggests sparrow foot marks. The sparrow foot marks are due to broken windshield.

17. Ans. **c. Coagulation of proteins and present in both ante-mortem and post-mortem burn**

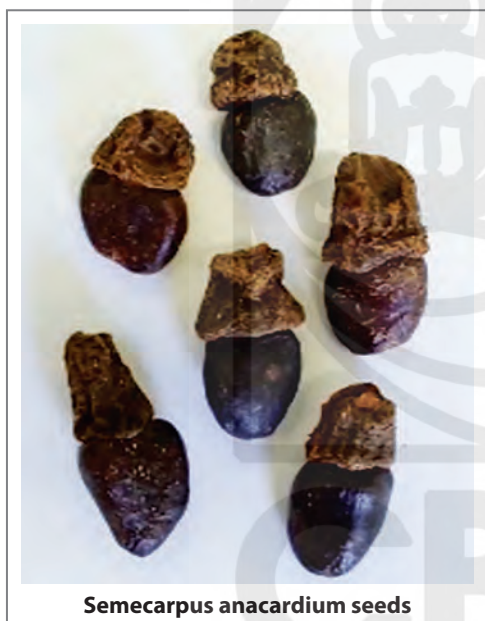
The posture is suggestive of pugilistic attitude or defense attitude. The pugilistic attitude is due to coagulation of muscle proteins. It is a nonspecific sign, seen in ante-mortem burns & postmortem burns also.

18. Ans. **a. Primary impact injury**

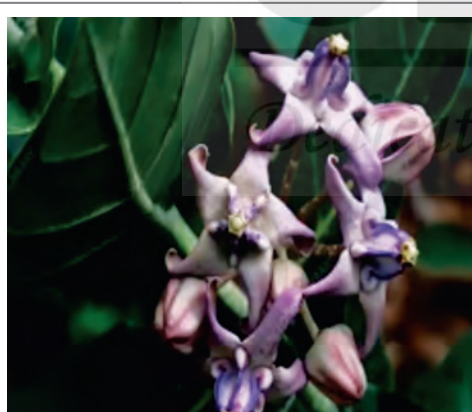
- The tibial fracture on the left leg of a RTA victim is due to the bumper impact of the vehicle.
- The injury due to the first impact with vehicle (bumper impact) is known as primary impact injury.



Croton seeds



Semecarpus anacardium seeds




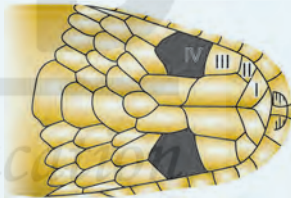
Calotropis plant

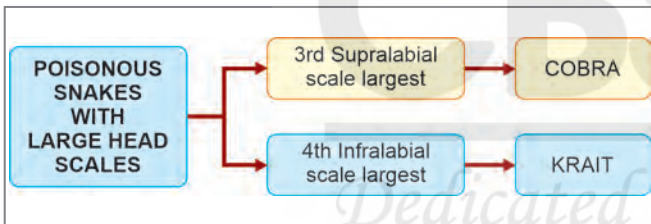
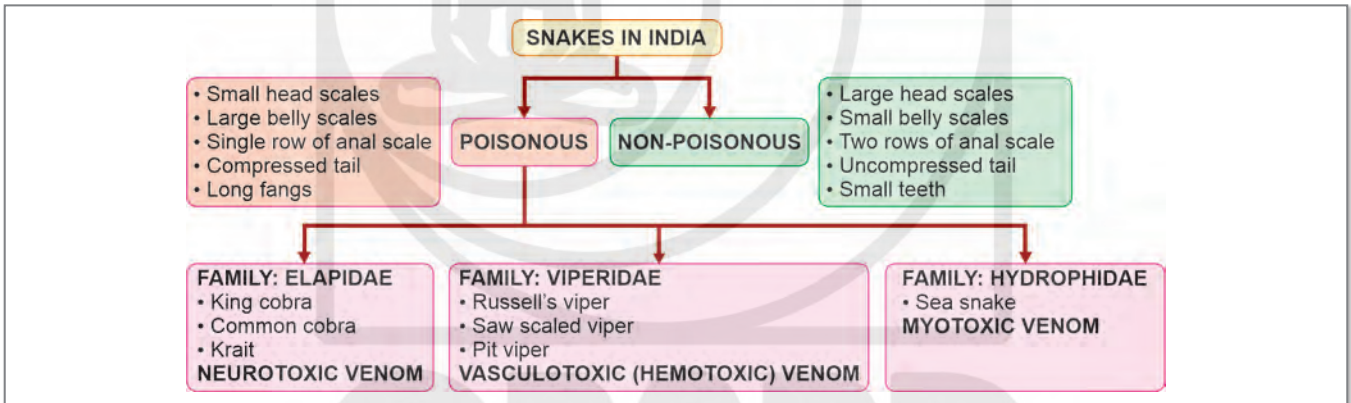
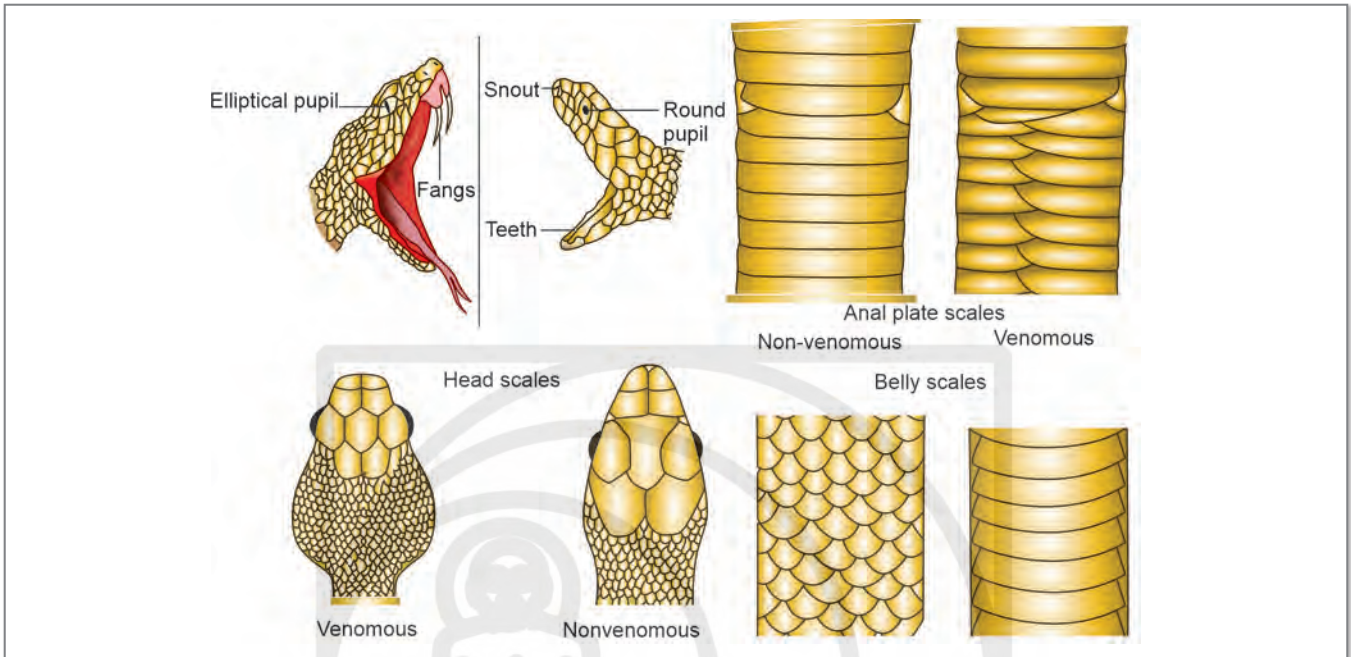
Extra Edge

Hunan Hand Syndrome

- Painful contact dermatitis to capsaicin (the active principle of capsicum)
- Frequently presents in cooks and chili pepper workers after preparing or handling chili peppers.
- Contact with other body parts gives rise - "Hunan nose" "Hunan eye", and "Chili Willie".
- Capsaicin binds with pain receptors causing the sensation of intense heat or burning.

ANIMAL IRRITANTS: SNAKES

Appearance	Venomous snakes	Non-venomous snakes
Habit	Nocturnal	Not specific
Head scales	<p>Usually small^Q 3 exceptions (Poisonous snakes with large head scales)</p> <ul style="list-style-type: none"> • Cobra • Krait <p>Cobra: 3rd labial largest, touches eye and nasal shields</p>  <p>Krait: 4 infralabials scales below mouth and 4th being largest</p> 	Usually large
Belly scales	Large and cover the entire breadth of belly ^Q	Small
Tail	Compressed ^Q	Not compressed
Fangs	Long and canalized, like hypodermic needle	Short or small grooved teeth
Bite mark	Two fang marks ^Q	Small teeth marks ^Q



Fatal dose

- Common cobra - 15 mg
- King cobra - 12 mg
- Krait - 2.5-6 mg^Q
- Russell's viper - 40 mg
- Saw scaled viper - 8 mg

- **Ophiology**^Q: Study of snakes; **Ophitoxemia**^Q: Circulation of snake venom in blood.
- Four venomous snake species are responsible for most of the human snake bite cases in India.
- They are referred to as the **big four**.

The big four:

1. **Indian cobra**, *Naja naja*^Q
2. **Common krait**, *Bungarus caeruleus*^Q
3. **Russell's viper**, *Daboia russelii*^Q
4. **Saw-scaled viper**, *Echis carinatus*^Q

Indian Antisnake venom is effective against

• <i>Cobra</i> ^Q	• <i>Russell's viper</i> ^Q
• <i>Krait</i> ^Q	• <i>Saw scaled viper</i> ^Q

- **Elapidae envenomation:** *Neuroparalytic*^Q manifestation
- **Viperidae envenomation:** Bleeding tendencies
- **Sea snake envenomation:** *Rhabdomyolysis*^Q and renal failure
- **Mamba snake:** Cardiotoxicity



Criminal Negligence

Features	Civil negligence	Criminal negligence
Negligence	Simple absence of skill & care ^Q	Gross carelessness ^Q & in attention to patient's safety
Trial by	Civil court ^Q	Criminal court
Patient's consent for the act	Good defense ^Q	Not a defense
Contributory negligence	Good defense	Not a defense
Evidences	Strong evidence is enough	Should be proven beyond reasonable doubt
Punishment	Fine ^Q	304 A IPC ^Q 2 years Imprisonment ^Q
Complainant	Patient is the complainant	Public prosecutor on behalf of Government

Extra Edge

- The *Supreme Court* has held that to prosecute a doctor for criminal negligence, it must be shown that the rash or negligent act by the accused has to be gross^Q.
- No fee was charged for the treatment cannot be a defense in cases of negligence.

Composite negligence:

- Damage to the patient is the result of the *combined effects of the negligence of some other persons (two or more)*.
- Each doctor is *jointly liable* for payment of the entire damages.

Bolam's Test

The judgment given by Mr. Justice Mc Nair in **Bolam vs. Frien hospital management committee** (1957) is a landmark decision in deciding cases of medical negligence and is known as the "Bolam Test."

- The test is for assessing the standard of the care in case of negligence.
- A physician need not possess the highest expert skill, it is sufficient if he exercises the average degree of skill, which other physicians exercise.
- A doctor can avoid a claim for negligence if he can prove that other medical professionals would also have act in the same way.

Illustrative



Criminal Negligence: Doctors Convicted

Mrs MP, 37-year-old woman, died during a laparoscopic sterilization surgery at a hospital, Kollam in September 2006. The prosecution charge was that the deceased, an NRI in Dubai, got admitted to the Hospital for the procedure on September 25, 2006 after her second delivery. But without subjecting her to any pre-operative tests, the surgery was conducted in haste on the same evening.

Post-operatively, the patient lost consciousness. She was referred to a nearby hospital the same night and then to a private hospital in Thiruvananthapuram the next day. Her condition worsened and she was declared dead. Following her death, her relatives lodged a police complaint accusing the hospital authorities of medical negligence. The Additional sessions court concluded that the facts and circumstances of the case and the discussions made on the basis of cases relied upon by the parties, is that the doctors were clearly fastened with medical negligence, requiring them to prosecuted under 304 A IPC. The court convicted three doctors (Anesthetist, Gynecologist & Surgeon) and three nurses for one-year imprisonment. An additional three months imprisonment under Sec. 201 IPC (destruction of evidence) and Sec. 34 IPC (jointly committing an offence) was awarded.

VARIOUS DOCTRINES RELATED WITH MEDICAL NEGLIGENCE

Res Ipsa Loquitur^Q or the 'Thing Speaks for Itself'^Q

- The negligent act is so obvious that the patient need not prove the doctor's guilt with medical evidence.

Examples

- Leaving surgical instruments/sponges in the abdomen.
- Failure to give tetanus toxoid in cases of injury.
- Surgery on the wrong side/wrong organ/wrong person.
- Mismatched blood transfusion.

- NO need of Medical expert witness to prove the negligence.
- The doctor has to prove his innocence (*burden of proof lies on the doctor^Q*).
- Applies to both civil and criminal negligence.

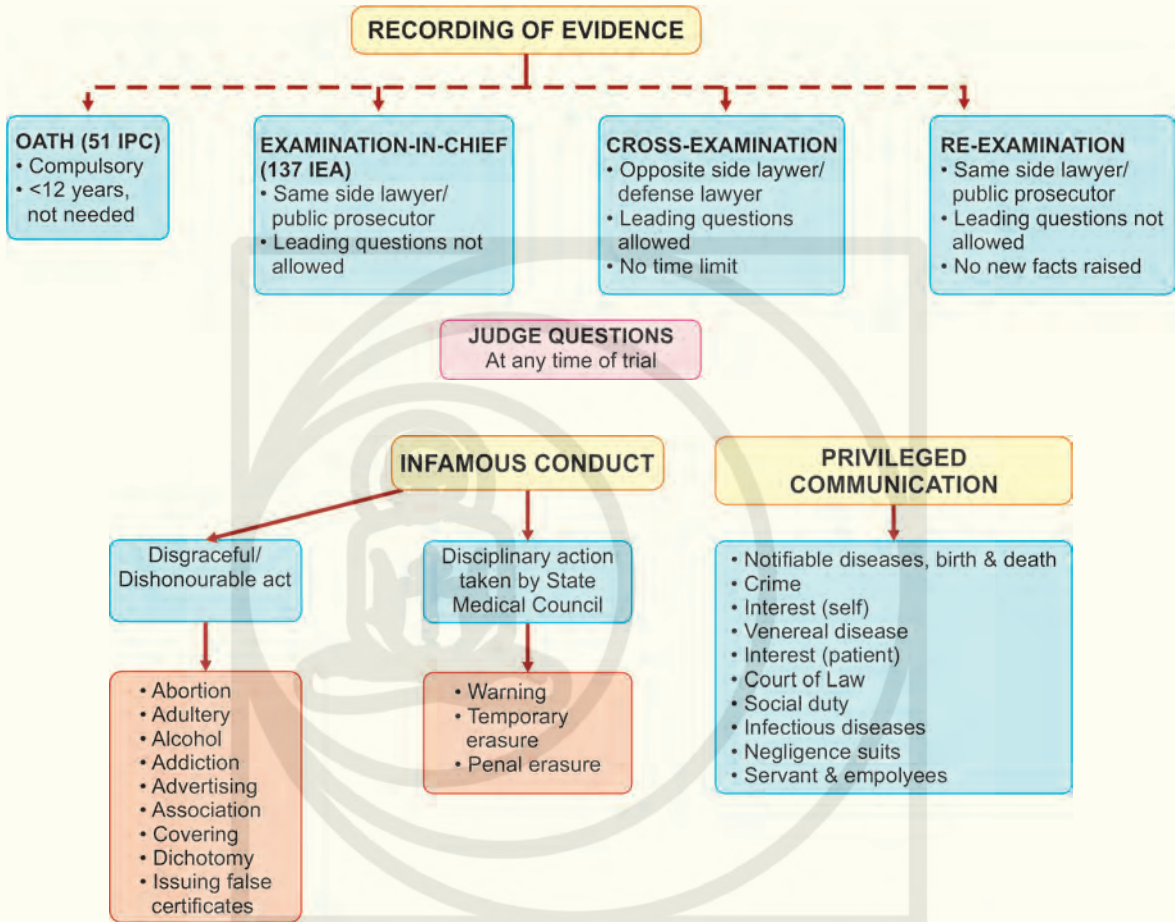
This doctrine is applied when the following three conditions are satisfied:

- In the absence of doctor's negligence, the said injury would not have occurred.
- Doctor had exclusive control over the injury producing instrument.
- Patient was not guilty of contributory negligence.



Chapter at a Glance

Theory



CBSPD

Dedicated to Education

Forensic Medicine Nothing Beyond for PGMEE/NEXT

Salient Features

- This book has been scripted very thoughtfully, keeping in mind all the qualms that we face as a PG aspirant, like referring to multiple books, reading monotonous texts, facing the issue of the nonclarity of controversial questions, struggling with understanding of various implications of forensic laws due to lack of case studies, and lacking the image-based studies.
- Every concept is depicted in the most comprehensible way and also supplemented with appropriate images to help you remember and recollect those concepts without any hassles.
- Constant reinforcement without repetition of the content makes you feel confident in facing any question that may arise, as you finish each chapter.
- Illustrative case studies to understand the practical importance of what you study, and also to develop more interest in reading the subject.
- The general questions and the image-based questions at the end of each chapter have been given to make sure that you have digested the concepts thoroughly before you proceed to the next chapter.
- Spotters provided will help you in visual memory for image-based questions in PGME Exams and also in UG Practical Exams.
- Flowcharts given under Chapter at a Glance will help you revise the content just in one go.
- Frequently-repeated points are given in last-minute tidbits to aid your revision process before the exams.

About the Author

J Magendran, MBBS, MD, Gold medalist, is currently working as a Professor in the Department of Forensic Medicine, Saveetha Medical College, Saveetha University, Chennai, Tamil Nadu. With great passion and interest in Forensic Medicine, he opted for the subject in his very first attempt of the PG Entrance Examination. He has made understanding of the subject easier by authoring several books —KONCPT-20 NEET-2020 (FMT Section), All India PG 20 Authors to name a few. He is also editing JIPMER 20 Authors book. Apart from his continuing zest in making his classes innovative and engaging, he also has a very keen interest in research activities. Besides, the author has to his credit many National and International publications.



Join Author's Discussion Group



Forensic Medicine Nothing Beyond by **Dr. Magendran**

Students' Reviews

Humesh
GMC, Amritsar

This book is best book available for NEET PG preparation. While reading this book, it feels like someone is sitting in front of you and infusing concepts in your brain. Pictorial representation and colorful tables, last-minute-frequently asked questions are awesome part of the book. Image-based questions at the end of chapter provide a good revision of concepts covered in the chapter.



Rahul Manohar Lal Sodhai
GMC, Latur

Forensic Medicine usually feels quite interesting when we learn it with the help of colorful pictures. This book have a lot of colorful pictures which help me a lot in understanding the topics and making this subject more interesting for me. The synopsis part is best, it covers all the important points.



Rahul Mazumdar
Jorhat Medical College and Hospital, Jorhat, Assam

The Wow factor of the book is the presentation and the way the information is portrayed. It becomes easy for us to find every small details so easily. The pictures are also amazing. The content is up to date. Although there is scope for improvement in the number of MCQs given, nevertheless it's amazing.



Ribhav Gupta
HIMS, Jolly Grant, Dehradun

This book helps to integrate various subjects. All important points and MCQs are covered and images and mnemonics help in understanding the content in easy way. The best part is guidance given in the beginning by J. Magendran sir. The frequently asked concepts, chapter at glance and the terminology given in the starting of chapter make this book THE GOLD STANDARD FOR ALL PG EXAMS.



Nishchal Gupta
Kathmandu University School of Medical Sciences, Kathmandu University

The simplest language has been used in the collection of questions, which have diversity, and are easy to cover in short time for revision.



CBS Publishers & Distributors Pvt. Ltd.

4819/XI, Prahlad Street, 24 Ansari Road, Daryaganj, New Delhi 110 002, India
E-mail: feedback@cbspd.com, Website: www.cbspd.com
New Delhi | Bengaluru | Chennai | Kochi | Kolkata | Lucknow | Mumbai | Pune
Hyderabad | Nagpur | Patna | Vijayawada

ISBN: 978-93-94525-01-6



9 789394 525016