

A

SECTION

Subject wise Synopsis and MCQs



Fundamentals of Nursing

Medical Surgical Nursing/Adult Health Nursing

Pharmacology

Community Health Nursing

Psychiatric Nursing

Obstetric and Gynecological Nursing

Pediatric Nursing

Nursing Knowledge Tree
An Initiative by CBS Nursing Division

Biochemistry and Nutrition

Microbiology

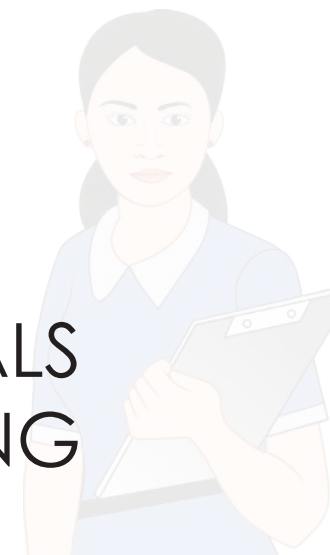
Nursing Research

Nursing Education

Nursing Administration

“One day in perfect health is much.”

—Arabic



1

CHAPTER

FUNDAMENTALS OF NURSING

SYNOPSIS

FUNDAMENTALS OF NURSING

HISTORY OF NURSING

Florence Nightingale

- Florence Nightingale, also known as “the Lady with the Lamp,” was a philosopher and founder of Modern Nursing.
- She was born in Florence, Italy on May 12, 1820 and died on August 13, 1910 *KPSC Sept 2019*.
- Every year, International Nurses Day is celebrated on 12th May.

Nursing in India

- In 1871, the first school of nursing was started in Government General Hospital, Madras (now Chennai) with 6 months Diploma in Midwives’ Program.
- In 1926, Madras state (now Tamil Nadu) formed first registration council to provide basic standards in education and training.
- In 1908, Trained Nurses Association of India (TNAI) was formed.
- In 1946, the first four years’ bachelor’s degree program was established at RAK College of Nursing in Delhi and Christian Medical College, Vellore.
- The Indian Nursing Council Act was passed by ordinance on December 31, 1947.
- Nursing Council Act came into existence in 1948 to constitute a council of nurses.
- In 1959, the first master’s degree course, a two-year postgraduate program, was started at the RAK College of Nursing, Delhi.
- 1986–M. phil in nursing started in RAK College
- 1992–PhD in nursing started in RAK College of Nursing

NURSING EDUCATION

Categories of Nursing Education

Course	Duration
General Nursing and Midwifery	3 years and 6 months
Auxiliary Nurse Midwife	18 months and 6 months internship
BSc Nursing	4 years
Post-basic Nursing	2 years
MSc Nursing	2 years

Contd...

Course	Duration
MPhil Nursing	1-year course for regular candidate and 2-year course for part-time candidate
PhD in Nursing	3 years – full time 5 years – part time



Key Points

- **Florence Nightingale** defined Nursing as “**the art of utilizing the environment of patients to assist them in their recovery.**”
- **Environment** is the focus of nursing care in Nightingale’s theory.
- A profession requires an extended education/training of its members as well as a basic foundation.

Characteristics of a profession:

- Profession has a theoretical body of knowledge leading to defined skills and abilities
- A profession provides a specific service

LEGAL AND ETHICAL ASPECTS IN NURSING

Ethics

Refers to well-founded standards of right or wrong that prescribe what humans ought to do, usually in terms of rights, obligations, benefits to society, fairness, or specific virtues.

Autonomy: Right to make one’s own decision. It is about respecting other people’s wishes and supporting them in their decisions.

Beneficence: Doing good to others.

Nonmaleficence: No harm to others.

Justice: It is also called fairness, i.e., to treat equally and fairly.

Fidelity: Faithful to agreement and promises.

Veracity: Telling the truth *KPSC December 2021*.

Accountability: Answerable to oneself and others for own action.

Responsibility: Specific accountability or liability associated with the performance of duties of a particular role.

Code of Ethics for Nurses

- Code of ethics serves as a means of self-regulation and sets the standard of individual behavior for the profession. Professional code of ethics is a system of rules and principles and nurses adhere to the professional practice standards by following these.
- The Nurses code was first established by the **International Council of Nurses Codes** in 1953. The ICN code of ethics for nurses, most recently, was revised in the year 2012.
- **Four principal elements of ICN code of ethics:**
 1. Nurses and people
 2. Nurses and practice
 3. Nurses and the profession
 4. Nurses and co-workers
- The fundamental responsibility of the nurse is in four areas, namely, to promote health, to prevent illness, to restore health, and to alleviate suffering.

Legal Aspects in Nursing

Torts

It is a wrongful act committed against a person or property. Torts may be classified as Intentional and Unintentional torts.

Intentional Torts

A purposeful act that violates another person's rights:

- **Assault:** It is an act of unlawful threat or attempt to do bodily injury to another, e.g., threaten to give injection without consent.
- **Battery:** It is any unlawful or intentional touching of a person without consent that may or may not cause harm.
- **Invasion of privacy:** It is an unwanted intrusion into person's private affairs.
- **Defamation of character:** It is communication of false statements that result in damage to the reputation of a person. There are two types of defamation. They are:
 1. **Libel:** This type of defamation can take place in the form of print, writing or picture. *KPSC Sept 2019, Dec 2021*.
 2. **Slander (Oral):** Defamation occurs in the form of spoken words or false words.
- **Fraud:** It is a deliberate deception intended to secure unfair or unlawful gain.
- **Intrusion:** It is an act of invasion into another person's private affairs.
- **Public disclosure:** It is an act of revealing some information about a person's private life.
- **Malice:** It is an act of publishing despite a false information about someone knowing that it is false.
- **Appropriation:** It refers to the use of a person's name or image for unauthorized commercial use without his/her knowledge.

Unintentional Torts *KPSC Feb 2016*

- **Negligence:** It is an act or conduct that falls below the standard of care. The standard is established by law for the protection of others against an unreasonably great risk of harm.
- **Malpractice:** It is professional negligence or carelessness committed by a professional person. *KPSC April 2015, Sept 2019* If the professional does not meet the standard while performing care, they may be held liable for negligence.

Crime

An act committed for violation of law where the consequence of conviction by a court is punishment, especially where the punishment is a serious one such as imprisonment. It can be classified as:

- **Felony:** It is a crime of serious nature which involves a potential punishment of one year or longer in prison.
- **Misdemeanor:** It is a lesser criminal act which is punished less severely than felony (<1 year imprisonment).

Good Samaritan Law

It generally provides basic legal protection to the healthcare provider who renders first aid in an emergency to an injured person, e.g., Good Samaritan law protects rescuer who voluntarily performs CPR on a victim.

PROFESSIONAL VALUES

Professional values are the guiding beliefs and principles that influence work behavior.

- **Altruism:** Selfless concern of a nurse for the wellbeing of patients and others, e.g., advocating for vulnerable patients and mentoring other healthcare professionals.
- **Autonomy:** Right to self-determination, e.g., Nurse should respect patient's rights to make decisions on their treatment, e.g., plan of care in consultation with patients.
- **Integrity:** The quality of being honest and act in accordance with code of ethics, e.g., providing honest information to patients and family, taking responsibility for own actions and accurate documentation.
- **Human dignity:** Respect for the uniqueness of individuals/people, e.g., culturally competent care to patient, respecting patient's privacy and maintaining confidentiality of patient's information.
- **Social justice:** "Acting in accordance with fair treatment regardless of economic status, ethnicity, age, citizenship, disability, or sexual orientation" (American Association of College of Nursing, 2007), e.g., facilitate universal access to healthcare and nondiscrimination in delivery of nursing care.

ADMISSION AND DISCHARGE

Admission

Admission is entry of a patient in a health care facility.

Types of Admissions

- **Routine admissions:** These admissions are planned prior.
- **Emergency admissions:** Admissions with no prior planning because of sudden illness, injury, worsening of existing condition, etc.
- **Medicolegal issues-related admission:** Chief Medical Officer and police need to be informed about such admissions and these records should be kept confidential with proper label.

Discharge

Discharge is release of a patient from a health care facility.



Instruments Used for Physical Examination (Table 1)

TABLE 1: Instruments used for physical examination

Instruments	Purpose	Pictures of the instrument
Ophthalmoscope	Examining the eyes	
Otoscope	Examining ear	
Stethoscope	Auscultation (Listening to body sounds)	
Sphygmomanometer	To measure BP	

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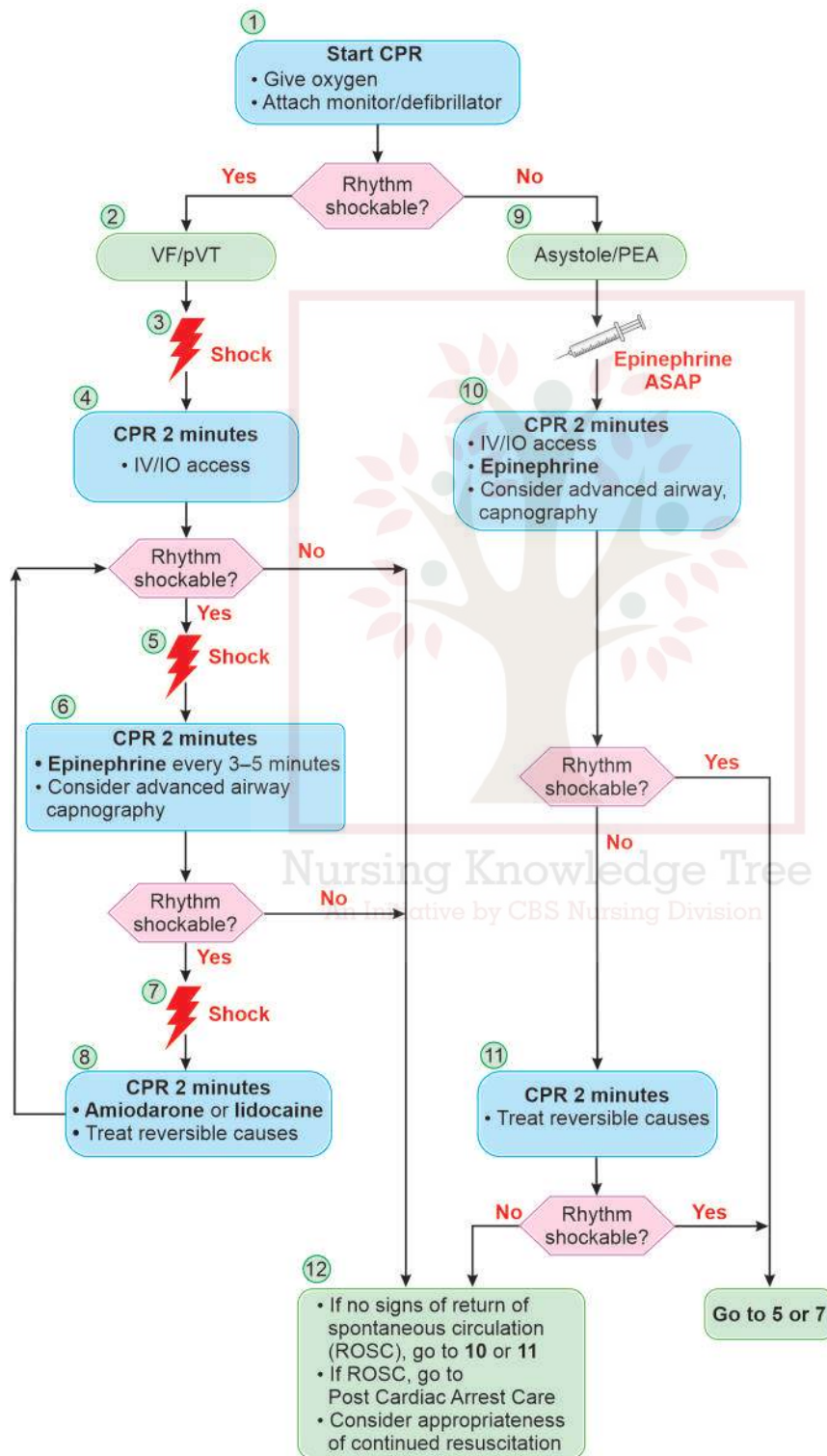


Instruments	Purpose	Pictures of the instrument
Thermometer	To measure the body temperature	
Urinometer	To measure the specific gravity of urine	
Glucometer	To measure the blood glucose level	
Snellen chart	To measure the visual acuity	

Contd...



Adult cardiac arrest algorithm (VF/pVT/Asystole/PEA)



CPR quality
<ul style="list-style-type: none"> • Push hard (at least 2 inches [5 cm]) and fast (100–120/min) and allow complete chest recoil • Minimize interruptions in compressions. • Avoid excessive ventilation • Change compressor every 2 minutes or sooner if fatigued • If no advanced airway, 30:2 compression-ventilation ratio, or 1 breath every 6 seconds • Quantitative waveform capnography – If PETCO₂ is low or decreasing, reassess CPR quality.
Shock energy for defibrillation
<ul style="list-style-type: none"> • Biphasic: Manufacturer recommendation (e.g., initial dose of 120–200 J); if unknown, use maximum available • Second and subsequent doses should be equivalent, and higher doses may be considered. • Monophasic: 360 J
Drug therapy
<ul style="list-style-type: none"> • Epinephrine IV/IO dose: 1 mg every 3–5 minutes • Amiodarone IV/IO Dose: First dose: 300 mg bolus Second dose: 150 mg or • Lidocaine IV/IO dose: First dose: 1–1.5 mg/kg. Second dose: 0.5–0.75 mg/kg.
Advanced airway
<ul style="list-style-type: none"> • Endotracheal intubation or supraglottic advanced airway • Waveform capnography or capnometry to confirm and monitor ET tube placement • Once advanced airway in place, give 1 breath every 6 seconds (10 breaths/min) with continuous chest compression
Return of spontaneous circulation (ROSC)
<ul style="list-style-type: none"> • Pulse and blood pressure • Abrupt sustained increase in PETCO₂ (typically ≥40 mm Hg) • Spontaneous arterial pressure waves with intra-arterial monitoring
Reversible causes
<ul style="list-style-type: none"> • Hypovolemia • Hypoxia • Hydrogen ion (acidosis) • Hypo-/hyperkalemia • Hypothermia • Tension pneumothorax • Tamponade, cardiac • Toxins • Thrombosis, pulmonary • Thrombosis, coronary

Figure 20: Adult cardiac arrest algorithm

(Ref: American heart association)



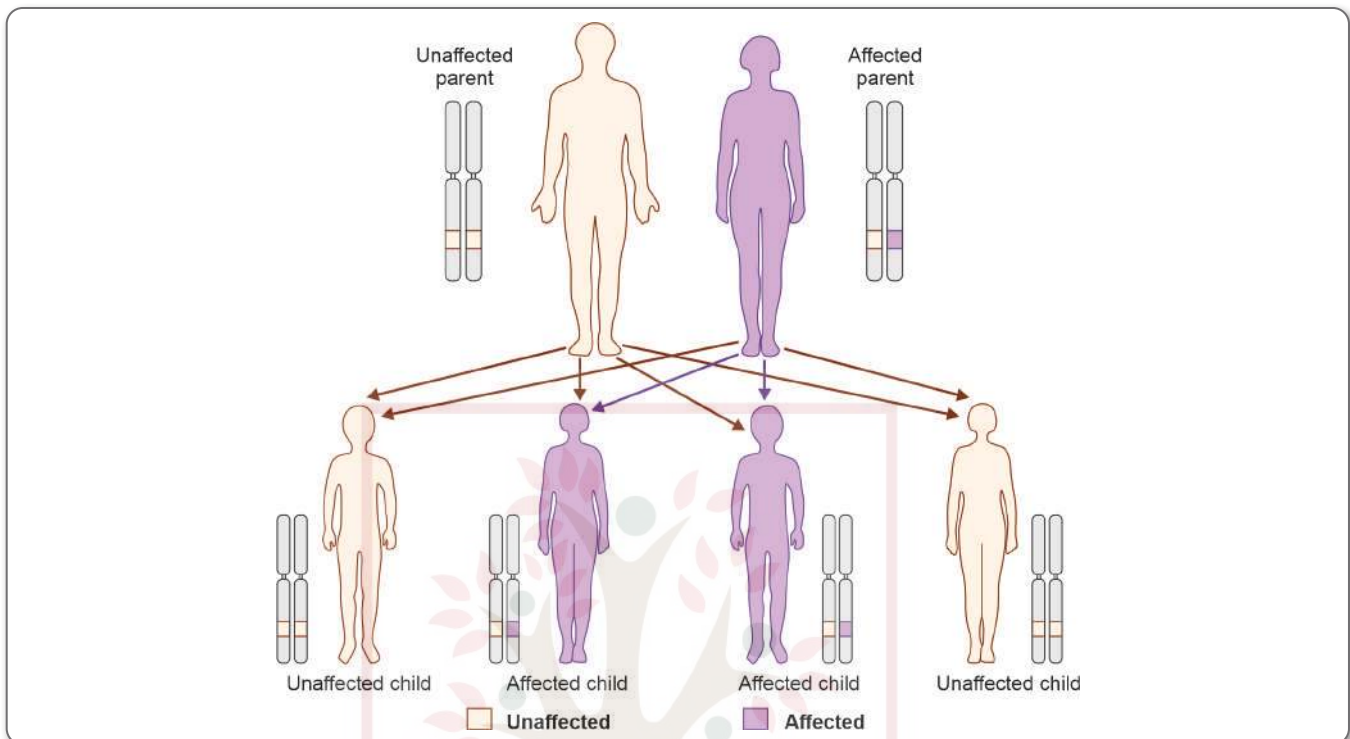


Figure 25: Autosomal dominant

Autosomal Recessive

- A diseased child will be born from both carrier parents (Fig. 26). Not all generation develop disease.
Example – Sickle cell anemia, phenylketonuria, cystic fibrosis, Tay-Sachs disease.
- An autosomal recessive disorder means two copies of an abnormal gene must be present in order for the disease or trait to develop.

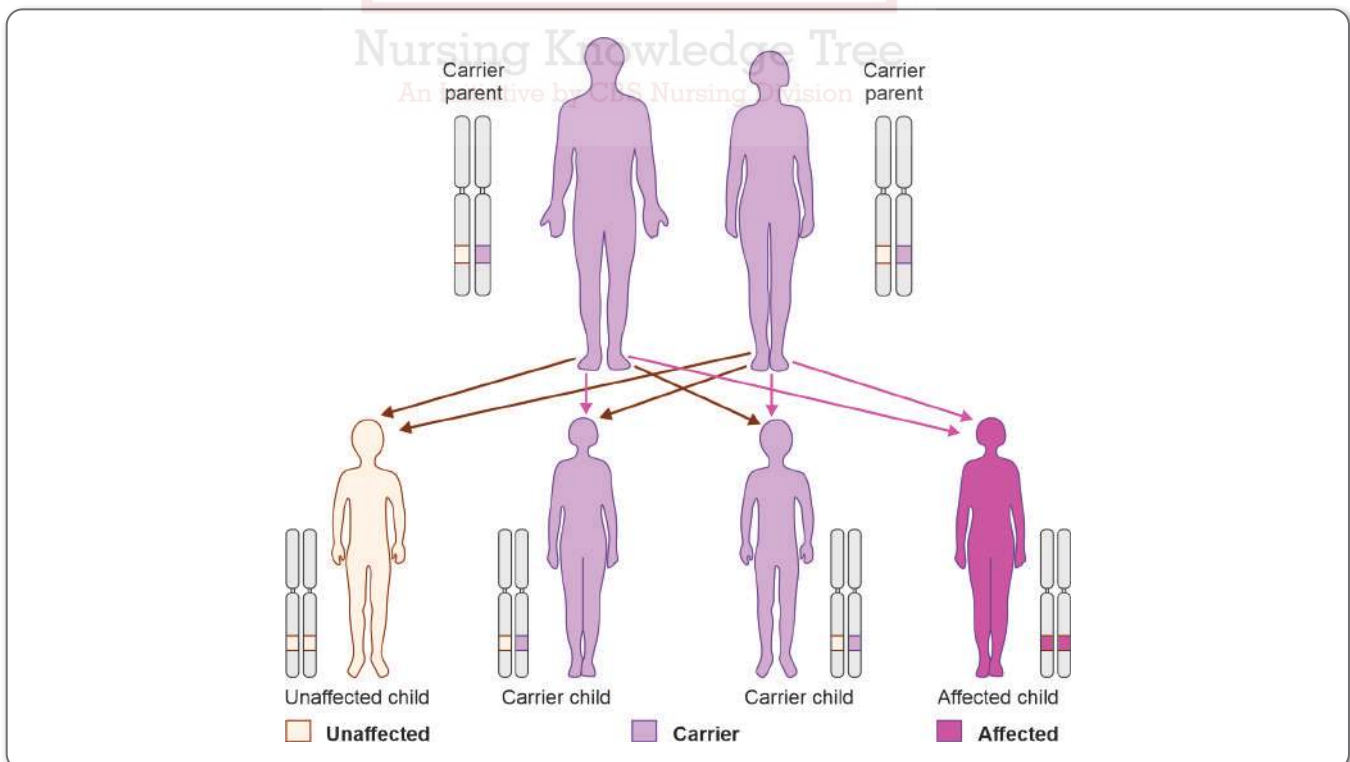


Figure 26: Autosomal recessive



14. Kubler-Ross and Glasser and Strauss are the pioneers in the Theory of Death and Dying.
15. Grief is a response to actual or anticipated loss.
16. Bereavement is a common depressed reaction to the death of a loved one.
17. **The study of death and dying is known as Thanatology.**
18. Children from infancy to 5 years do not understand the concept of death. In this age, Sense of separation forms basis for later understanding of loss and death.
19. Adolescents from 12 to 18 years of age fear a lingering death.
20. Recognizing and acknowledging death is important so that **Patient's comfort is maximized.**
21. Everybody grieves in his/her own unique way.
22. A funeral provides people with the opportunity to **enact what a person's life meant and will continue to mean.**
23. A risk that nurses experience as a result of multiple losses in the course of work with a failure to adequately process them is known as bereavement overload.
24. Rigor mortis starts 2 to 4 hours after death.
25. Mendel is known as the Father of Genetics.
26. Alleles are alternative form of genes.
27. Mitosis creates two identical daughter cells; each contains the same number of Chromosomes as its parent cells (**2n to 2n**).
28. In Meiosis, two daughter cells form half number of chromosomes (**2n to n**).
29. In autosomal dominant disorder:
30. a single copy of the mutated gene (from one parent) is enough to cause the disorder.
31. If single parent is affected, then each child (male or female) has 50% chance to be an affected child.
32. In autosomal recessive disorder, if both parents are carriers:
33. a female child has 50% chance to be an affected and 50% chance to be a carrier.
34. a male child has 50% chance to be a carrier and 50% chance to be normal.
35. If a woman is a carrier of an X-linked ectodermal dysplasia, there is a 50% chance that each son will be affected and a 50% chance that each daughter will be a carrier, like the mother.
36. Cystic fibrosis is autosomal recessive disorder.
37. Meconium Ileus (MI) is one of the earliest manifestations of cystic fibrosis (CF).
38. Down syndrome has an extra copy of chromosome 21 known as Trisomy of 21st chromosome.
39. Trisomy 13 - **Patau Syndrome**
40. Trisomy 18 - Edward Syndrome
41. The main treatment for Phenylketonuria (PKU) is a low-protein diet that completely avoids high-protein foods (such as **meat, eggs and dairy products**).
42. Sickle cell anemia is an Autosomal recessive disorder.
43. **Sickle cell trait:** One normal hemoglobin gene from one parent and Hb S gene from another parent. It does not show symptoms of sickle cell anemia.
44. Thalassemia is also known as Mediterranean anemia or Cooley's anemia.
45. **Management of Thalassemia:** Regular blood transfusion and iron chelation therapy (IV/SC Deferoxamine).
46. **Glucose-6-Phosphate Dehydrogenase (G6PD)** is an X-linked recessive disorder.
47. Hemophilia A (Classic Hemophilia): Deficiency of clotting factor VIII.
48. Hemophilia B (Christmas Disease): Deficiency of clotting factor IX.
49. *Hemophilia C – Deficiency of factor XI.*
50. *For Celiac disease, lifelong gluten-free diet is advised.*
51. *Turner syndrome affects only females.* These females have only single copy of X chromosome (45, X) instead of two.
52. Klinefelter Syndrome is a chromosomal variation in males in which one extra X chromosome is present.
53. Maternal serum alpha-fetoprotein (MSAFP) screening is performed between 15–20 weeks of pregnancy.
54. Triple marker test is performed between 15–22 weeks (ideally between 15–18 weeks).
55. Trans-cervical Chorionic Villus Sampling (CVS) is avoided in *Cervical myoma, angulated uterus, uterine malformation or infection (genital herpes or cervicitis), vaginal bleeding.*
56. AFP level high in amniotic fluid indicates **Open neural tube defect.**
57. 17-hydroxyprogesterone high in amniotic fluid indicates **congenital adrenal hyperplasia.**



“He who has health has hope; and he who has hope has everything.”
—Arabian proverb



MULTIPLE CHOICE QUESTIONS

(Including Explained and Practice Questions)

FUNDAMENTALS OF NURSING

INTRODUCTION

1. Which of the following phrase best describes ‘the science of nursing’?

- a. Application of clinical skills
- b. Holistic approach in patient care
- c. Body of nursing knowledge
- d. Art of specialized nursing care

2. “Nursing encompasses autonomous and collaborative care of individuals of all ages, families, groups and communities, sick or well and in all settings.”

Which of the following Institution has given this definition regarding Nursing Professions in the year of 2002?

- a. INC
- b. WHO
- c. TNAI
- d. ICN

3. Which of the following agency defines the nursing and its values as “Nursing is the protection, promotion, and optimization of health and abilities, prevention of illness and injury, alleviation of suffering through the diagnosis and treatment of human response”?

- a. World Health Organization
- b. Indian Nursing Council
- c. American Nurse Association
- d. International Council of Nurses

4. The Word “Nurse” is rendered from the Latin word “NutriX” which refers the actual meaning of:

- a. Care
- b. Cure
- c. Nourish
- d. Nutritious

5. The knowledge-based Nursing practices and core skills for this profession mainly depend on the:

- a. Reporting and Documentation
- b. Research and Analysis
- c. Diagnosis, Intervention and Evaluation
- d. History collection and Assessment

Explanation: By performing the appropriate diagnosis for a condition and treating the condition with the actual intervention and evaluating the result will enhance the knowledge-based practice and limit the occurrence of error.

6. International Council for Nurses was first established in the year of:

- a. 1947
- b. 1953
- c. 1952
- d. 1956

HISTORY OF NURSING

7. The first school of nursing was established by:

- a. Virginia Henderson
- b. Theodor Fliedner
- c. Florence Nightingale
- d. Isabel Hampton

Explanation: In 1836, Pastor Theodor Fliedner established the Kaiserswerth School for Nursing in his parish in Kaiserswerth, Germany. It was one of the first formally established schools of nursing in the world. Florence Nightingale established St. Thomas’ Hospital and the Nightingale Training School for Nurses in 1860.

8. International day for nurses is celebrated on:

- a. December 1
- b. May 12
- c. June 2
- d. May 1

Explanation: International Nurses Day is celebrated on May 12, which is the birth day of Florence Nightingale.

9. Florence Nightingale was born on:

- a. May 12th 1820
- b. May 12th 1832
- c. April 7th 1820
- d. June 7th 1842

10. In 1860, Nightingale set up the first nursing training school at:

- a. St. Thomas’ Hospital, London
- b. University of Edinburgh
- c. Petersburg, Virginia
- d. None of the above

11. ICN theme for International Nurses Day 2022 is:

- a. Nurses: A Force for Change— A Vital Resource for Health
- b. Nurses: A Force for Change— Care Effective, Cost Effective
- c. Closing the Gap: Millennium Development Goals
- d. Nurses: A Voice to Lead - Invest in Nursing and Respect Rights to Secure Global Health

Explanation: ICN theme for International Nurses Day:

- 2022 - Nurses: A Voice to Lead - Invest in Nursing and Respect Rights to Secure Global Health
- 2021 - Nurses: A Voice to Lead - A Vision for Future Health care
- 2020 - Nurses: A Voice to Lead - Nursing the World to Health
- 2019 - Nurses: A Voice to Lead - Health for All
- 2018 - Nurses: A Voice to Lead - Health is a Human Right
- 2017 - Nurses: A Voice to Lead - Achieving the Sustainable Development Goals

LEGAL AND ETHICAL ASPECTS IN NURSING

12. Which of the following is not a value essential for a professional nurse?

- a. Human dignity
- b. Dependence
- c. Social justice
- d. Integrity

Explanation: Dependence is the state of relying on or being controlled by someone and it is an undesirable quality. The nurse is expected to have professional nursing values such as principles of human dignity, integrity, altruism, and justice.



Ans.

- 1. c
- 2. d
- 3. c
- 4. c
- 5. c
- 6. b
- 7. b
- 8. b
- 9. a
- 10. a
- 11. d
- 12. b

13. The doctrine of informed consent deals with:

- Full disclosure of all relevant facts to the patient
- Informing higher authorities about the patient's condition
- Notification of diseases
- Patient confidentiality

Explanation: Informed consent is taken from the patient or significant others before conducting any type of invasive procedure to communicate full disclosure of relevant facts regarding the procedure. In this, the patient and/or their attendants are informed about the condition of the patient along with the possible treatment strategies and the expected prognosis.

14. Patient whose life is threatened and who is comatose is assumed to give what kind of consent for life-sustaining treatment?

- Informed
- Implied
- Direct
- Expressed

Explanation: Implied consent is an assumption of permission to do something that is inferred from an individual's actions rather than explicitly provided. In case of emergency when delayed treatment would be dangerous, informed consent is not needed.

15. Principles of ethical practice include the following; except:

- Maleficence
- Beneficence
- Justice
- Respect for autonomy

Explanation: Maleficence means to harm some and is opposite of nonmaleficence which means "to not harm". Maleficence should not be used as principle for performing nursing action. Nonmaleficence is an ethical principle that obliges one to not inflict intentional harm. **Beneficence** refers to taking positive actions to help others.

Ethical principles include principle of respect for autonomy, principle of nonmaleficence, principle of beneficence, principle of justice, principle of veracity, etc.

16. All of the following are true regarding deontology; except:

- It focuses on the consequences of actions
- It encompasses natural law
- It incorporates dutiful actions of an individual
- It is also known as formalism

Explanation: Deontology is an ethical theory that says the morality of an action should be based on whether that action is right or wrong under a series of rules, rather than based on the consequences of the action.

17. Which of the following ethical principles refers to doing good to the client?

- Beneficence
- Nonmaleficence
- Autonomy
- Justice

Explanation:

- Beneficence:** Doing good for the client
- Nonmaleficence:** Doing no harm
- Autonomy:** Self-determination of client
- Justice:** Treat equally

18. Nurse fails to administer correct medication to the patient.

This action is known as:

- Negligence
- Crime
- Tort
- Battery

Explanation: Negligence is a type of malpractice. It refers to doing of something which a reasonably prudent person would not do, or the failure to do something which a reasonably prudent person would do, under circumstances similar to those shown by the evidence.

- Crime is an action or omission which constitutes an offence and is punishable by law.
- A tort, in common law jurisdictions, is a civil wrong that unfairly causes someone else to suffer loss or harm resulting in legal liability for the person who commits the tortious act, called a tortfeasor.
- Battery is the unlawful and unwanted touching or striking of one person by another, with the intention of bringing about a harmful or offensive contact.

19. Immunization causes pain in child but it will also provide protection against certain diseases. Which of the following ethical principle is applicable here?

- Justice
- Beneficence
- Nonmaleficence
- Autonomy

20. Physician ordered blood transfusion for a client, but her father refused blood transfusion. Which among the following is the appropriate action by health care workers?

- Try to make the father willing for blood transfusion
- Get court order for blood transfusion
- Do blood transfusion without listening to father
- Abide by the father's wishes and inform the health care provider

21. A nurse administered a wrong dose of medication to a client. Upon realizing the mistake, she immediately reported to the authority and did incidental reporting. This shows:

- Accountability
- Responsibility
- Authority
- Decision making

22. The patient's right to refuse treatment is an example of:

- Common law
- Religion clause
- Statutory law
- Nursing Council Act

23. Code of ethics for registered nurse defines the:

- Uniformity of care to all clients
- Principles by which nurses' provide care to their clients
- Protocols to be followed during nursing procedures
- All of the above

24. Which of the following is the nurse's best legal safeguard?

- Collective bargaining
- Competent practice
- Written or implied contracts
- Patient education

PROFESSIONAL VALUES**25. Which one of the following is not an attribute of a professional?**

- Concerned with quantity
- Concerned with quality of outcome
- Independent
- Self-directed

Ans.

- a
- b
- a
- a
- a
- a
- a
- a
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- a
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- b
- b
- a

“It is health that is real wealth and not pieces of gold and silver.”

—Mahatma Gandhi

CHAPTER 2

MEDICAL SURGICAL NURSING/ADULT HEALTH NURSING



SYNOPSIS

CARDIOVASCULAR SYSTEM

ANATOMIC AND PHYSIOLOGIC OVERVIEW OF HEART

- Heart is a cone shaped, hollow muscular organ located in the mediastinal space between the lungs and rests on the diaphragm.
- **Size:** 12 cm long × 8 cm width × 6 cm thickness
- **Weight:** About 300 gm

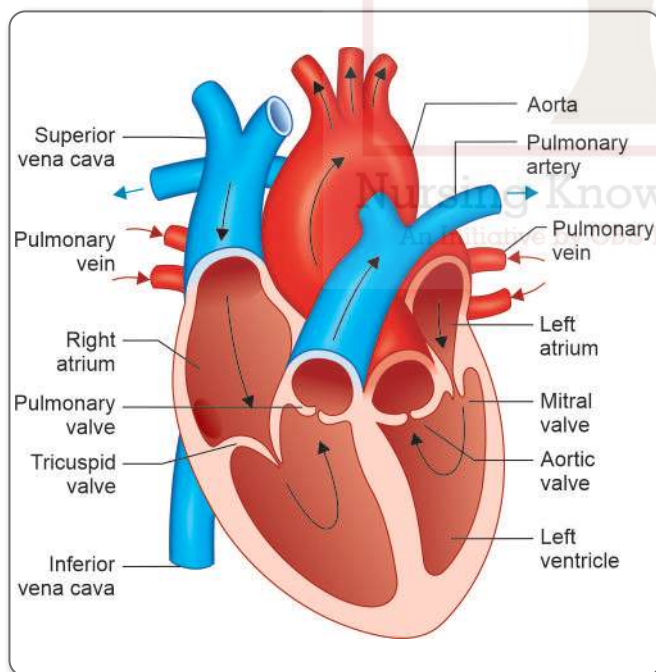


Figure 1: Anatomy of heart

Layers of Heart

- **Pericardium:** Outer most layer of heart; covering of heart; consists of three layers:

1. Fibrous pericardium (outermost layer)
2. Parietal pericardium (middle layer)
3. Visceral pericardium (epicardium)

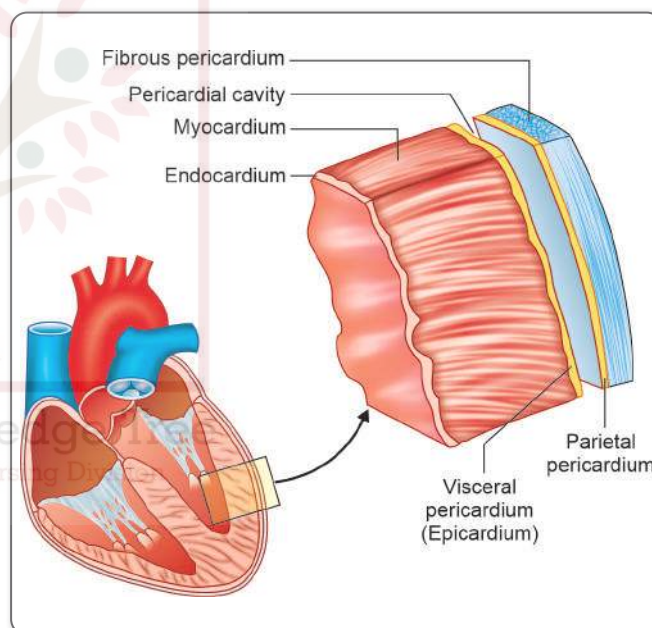


Figure 2: Cross section of heart showing its layers

- **Myocardium:** Middle layer of heart wall. Thickest layer of the heart wall. It is responsible for pumping action.
- **Endocardium:** Inner most layer of heart wall.

Heart Chambers

- It has four chambers:
 - 2 Atria (Right atrium and Left atrium)
 - 2 Ventricles (Right ventricle and Left ventricle)
- Left ventricle is the thickest chamber (10–15 mm)
- **Apex of the heart:** Conical area created by left ventricle. The apex is located near the mid-clavicular line in the 5th intercostal space.
- **Base of the heart:** Upper border of the heart is formed by left atrium. Lies just below the 2nd rib.

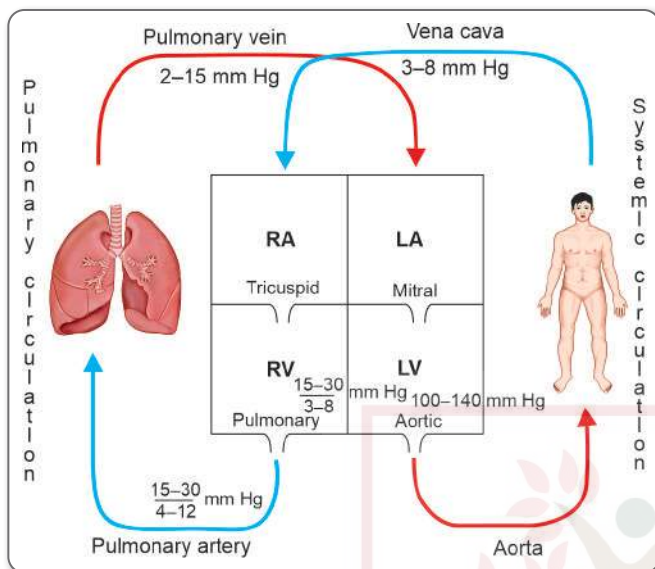


Figure 3: Schematic diagram of blood circulation in the heart

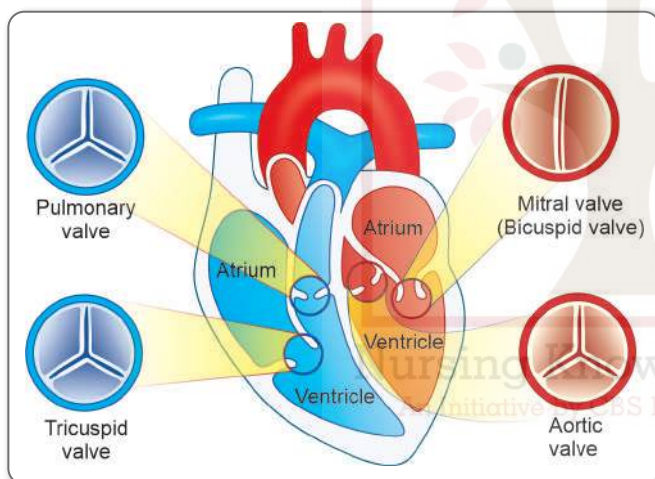


Figure 4: Valves of heart

Heart Valves

- **Two Atrio-ventricular (AV) valves**
 - **Bicuspid valve (Mitral valve):** Between left atrium and left ventricle KPSC Jan 2016
 - **Tricuspid valve:** Between right atrium and right ventricle
- **Two Semi-lunar valves** (half-moon shaped leaflet)
 - **Pulmonary valve:** Between pulmonary artery and right ventricle
 - **Aortic valve:** Between aorta and left ventricle

Coronary Arteries

- Left and right coronary arteries and their branches supply arterial blood to the heart.
- These arteries arise from aorta just above the aortic leaflet.
- Coronary arteries receive blood supply during diastole.
- Left coronary artery has three branches:
 1. Left main coronary artery

2. Left anterior descending artery (supply anterior wall of the heart)
 3. Circumflex artery (supply lateral wall of the heart).
- Right side of heart receives blood supply from right coronary artery.
 - Posterior wall of the heart receives blood from posterior descending artery.
 - Venous supply from the heart returns blood to the right atrium via coronary sinus located behind the right atrium.

Cardiac Conduction System

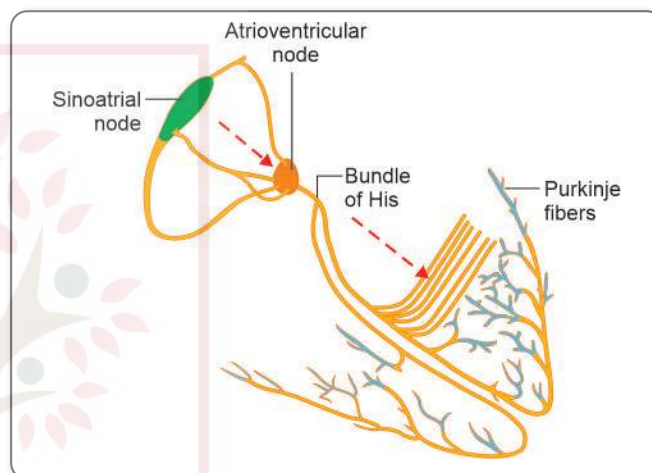


Figure 5: Cardiac conduction system

- Characteristics of cardiac conduction include:
 - **Automaticity:** Ability to initiate an electrical impulse
 - **Excitability:** Ability to respond to an electrical impulse
 - **Conductivity:** Ability to transmit electrical impulse from one cell to another.
- **SA node (Sino-Atrial node)**
 - It is the primary pacemaker of the heart.
 - Located at the junction between superior vena cava and right atrium.
 - SA node generates impulse at a rate of 60–100 per minute.
 - Electrical impulse is generated at SA node and conducted to AV node via inter nodal pathway.
- **AV node (Atrio-Ventricular node)**
 - Located in the right atrial wall near tricuspid valve.
 - AV node coordinates the incoming impulse from SA node.
 - After a slight delay, relays the impulses to ventricles.
- **Bundle of His**
 - Present in the septum between right and left ventricle.
 - It conducts the impulses received from AV node to Purkinje fibers.
 - It is divided into right and left bundle branch.
- **Purkinje fibers**
 - Terminal part of conduction system
 - Myocardial cells are stimulated causing cardiac contraction.

Note

Conduction of electrical impulse is fastest in Purkinje system (4 m/sec)



TABLE 1: Differences between arteries and veins

Characteristics	Artery	Vein
Direction of blood flow	Heart to the body	Body to the heart
Oxygen concentration	Carry oxygenated blood (except pulmonary artery and umbilical artery)	Carry de-oxygenated blood (except pulmonary vein and umbilical vein)
Anatomy	Thicker walls Narrow lumen	Thinner walls Large lumen
Valve	Absent	Present
Pressure	High	Low

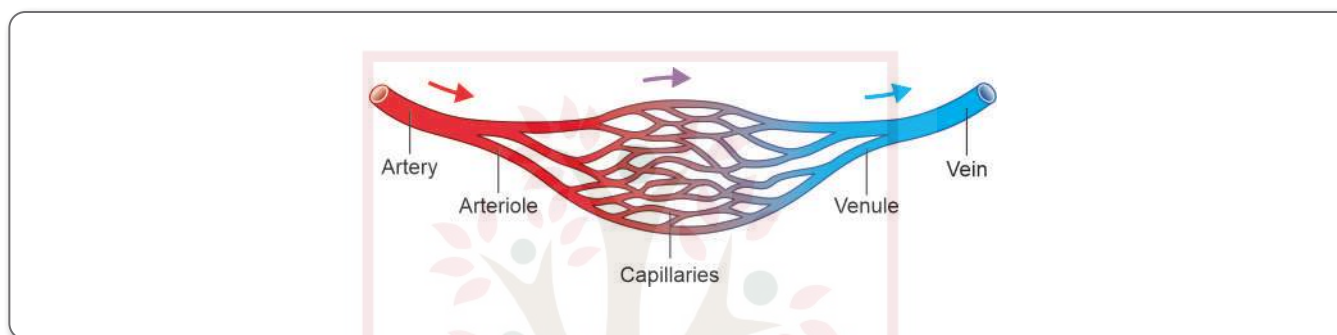


Figure 8: Exchange of blood between arterioles and venules

- Arterioles – Resistant vessels
- Capillaries – Exchange vessels
- Venules – Smallest veins

Blood Pressure

- Normal range of systolic blood pressure (SBP) – 90–140 mm Hg
- Normal range of diastolic blood pressure (DBP) – 60–90 mm Hg
- **Pulse Pressure:** Difference between SBP and DBP is known as pulse pressure. The normal range is 30–40 mm Hg.

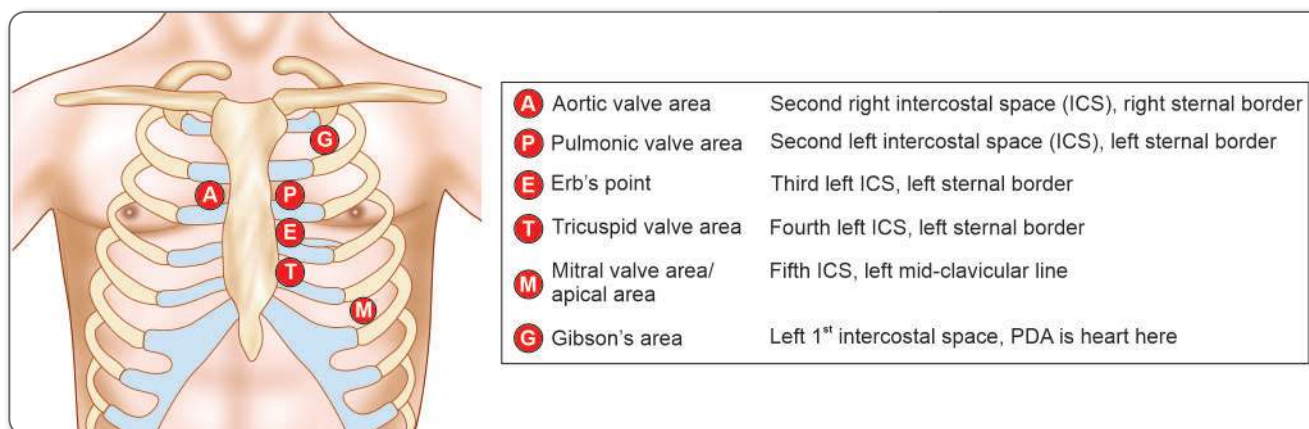
Auscultation Sites for Different Areas of Heart

Figure 9: Auscultation sites for different areas of heart



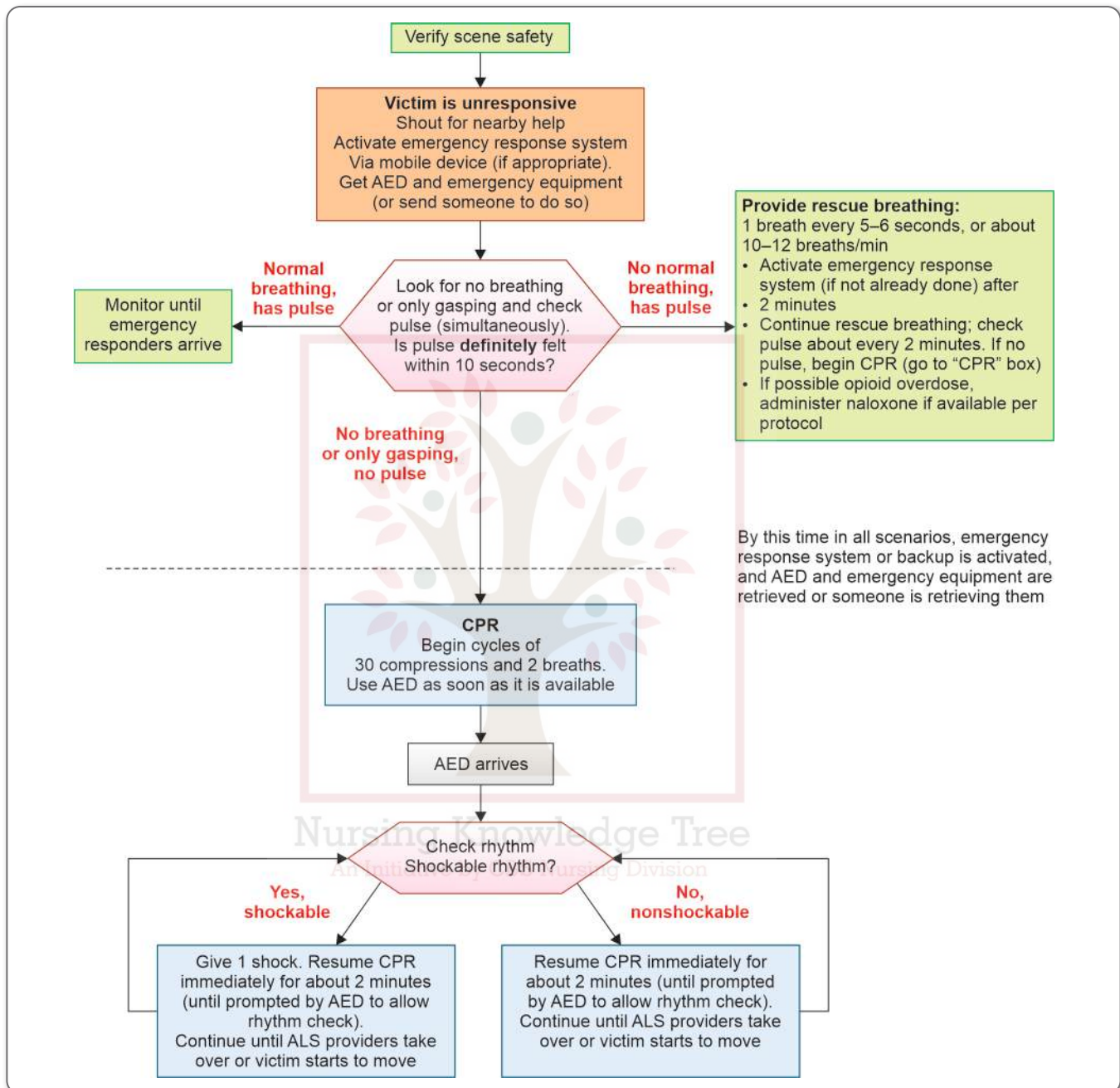


Figure 17: Cardiopulmonary resuscitation algorithm — 2015 update

HEMATOLOGY

ANATOMY AND PHYSIOLOGY OF HEMATOLOGIC SYSTEM

• Bone Marrow

- Aggregate weight of bone marrow in an adult is 3000 gm.
- Based upon the visual appearance it is divided as red and yellow.
- Red marrow is actively involved in hematopoiesis, while yellow marrow is less active in hematopoiesis.

■ Functions of bone marrow

- Maintenance of pluripotent stem cells from which blood cells are derived
- Origination and maturation of blood cells
- Storage of large number of RBCs and neutrophils
- Maturation of B-lymphocyte
- Antibody production

• Spleen

- Largest lymphoid organ in the body.
- Spleen is known as the graveyard of red blood cells.
- Acts as a site for humoral immune response to blood borne antigen.



- Damage to the spleen increases the risk for infection.
- Functions.
 - Helps in recycling iron from destroyed RBCs by capturing hemoglobin.
 - Removal of particles from RBCs without destroying it.
- **Formation of Blood Cells**
 - Hematopoiesis is the process of formation of blood cells
 - It starts in early embryonic period and persists throughout the life.
 - Major sites for hematopoiesis in adults are flat bones of sternum, ilium, ribs and vertebrae.
- **Blood**
 - Blood contains many types of cells such as RBCs, WBCs and platelets suspended in plasma.
 - 8% of body weight is of blood.
 - **Arterial blood is bright red in color** because of oxygen carrying hemoglobin and **venous blood is dark red in color** because of lack of oxygen
 - **Specific gravity of blood is 1.048–1.066**
 - **pH of blood is 7.35–7.45** KPSC July 2021
- **Plasma**
 - Liquid portion of the blood
 - Plasma = Blood – Cellular components
 - Serum = Plasma – Clotting factors
 - Straw-colored
 - Plasma is composed of 92% water, 7% protein and less than 1% nutrient and metabolic waste.

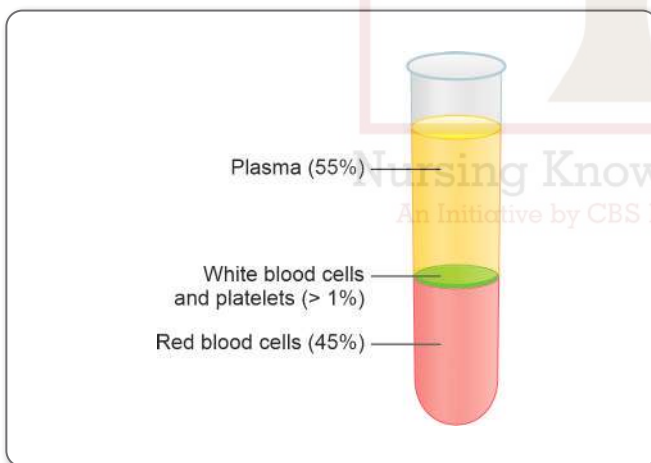


Figure 18: Components of blood

Hematocrit/Packed Cell Volume

- If a tube of blood is allowed to stand or centrifuged, blood cells settle down at the bottom. The term hematocrit or PCV is used to express the volume or percentage of RBCs in that sample.
- Normal hematocrit is 35%–45%.
- Hematocrit increases if plasma is less or RBCs are more, e.g., dehydration, increased RBC production (polycythemia).

- Hematocrit decreases if plasma is more or RBCs are less, e.g., overhydration, enhanced RBC loss, anemia.

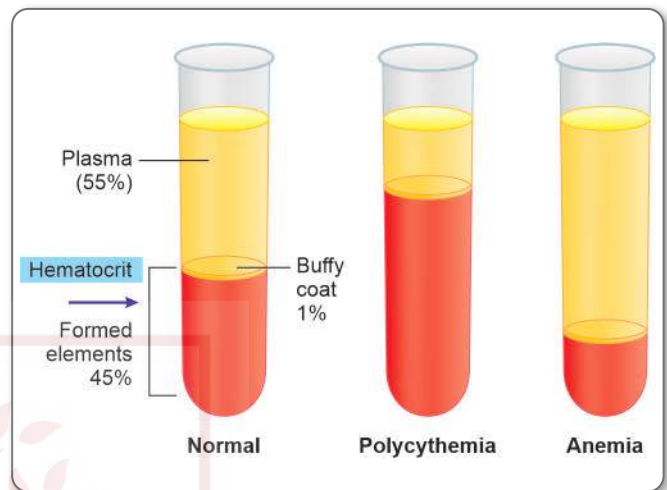


Figure 19: Hematocrit

Hematopoiesis

- Bone marrow contains pluripotent stem cells which give rise to different forms of blood cells.
- **RBCs/Erythrocyte**
 - They are oxygen carrying cells in the blood and they carry carbon dioxide back to the lung.
 - Mature RBC has no nucleus.
 - **Shape:** Bi-concave shape which increases the surface area of RBCs.
 - **Functions**
 - Carry oxygen and nutrients toward cells
 - Assist in excretion of waste products from tissue through lungs, kidneys and skin
 - Transporting hormones to the target site of action
 - Protecting body from harmful substance/organism
 - Hemostasis
 - Homeostasis
- **Megakaryocytes/platelets**
 - Hemostasis is the major function.
 - Time needed for the formation of platelet is **5 days**.
 - Hemostasis occurs in three stages:
 1. Vasoconstriction
 2. Formation of platelet plug
 3. Formation of fibrin clot
- **White blood cells/leukocytes**
 - Five types of WBCs.
 - Based upon the presence of granules in the cytoplasm they are classified as granulocytes and agranulocytes
 - **Granulocytes:** Neutrophil, eosinophil and basophils
 - **Agranulocytes:** Monocyte and lymphocyte



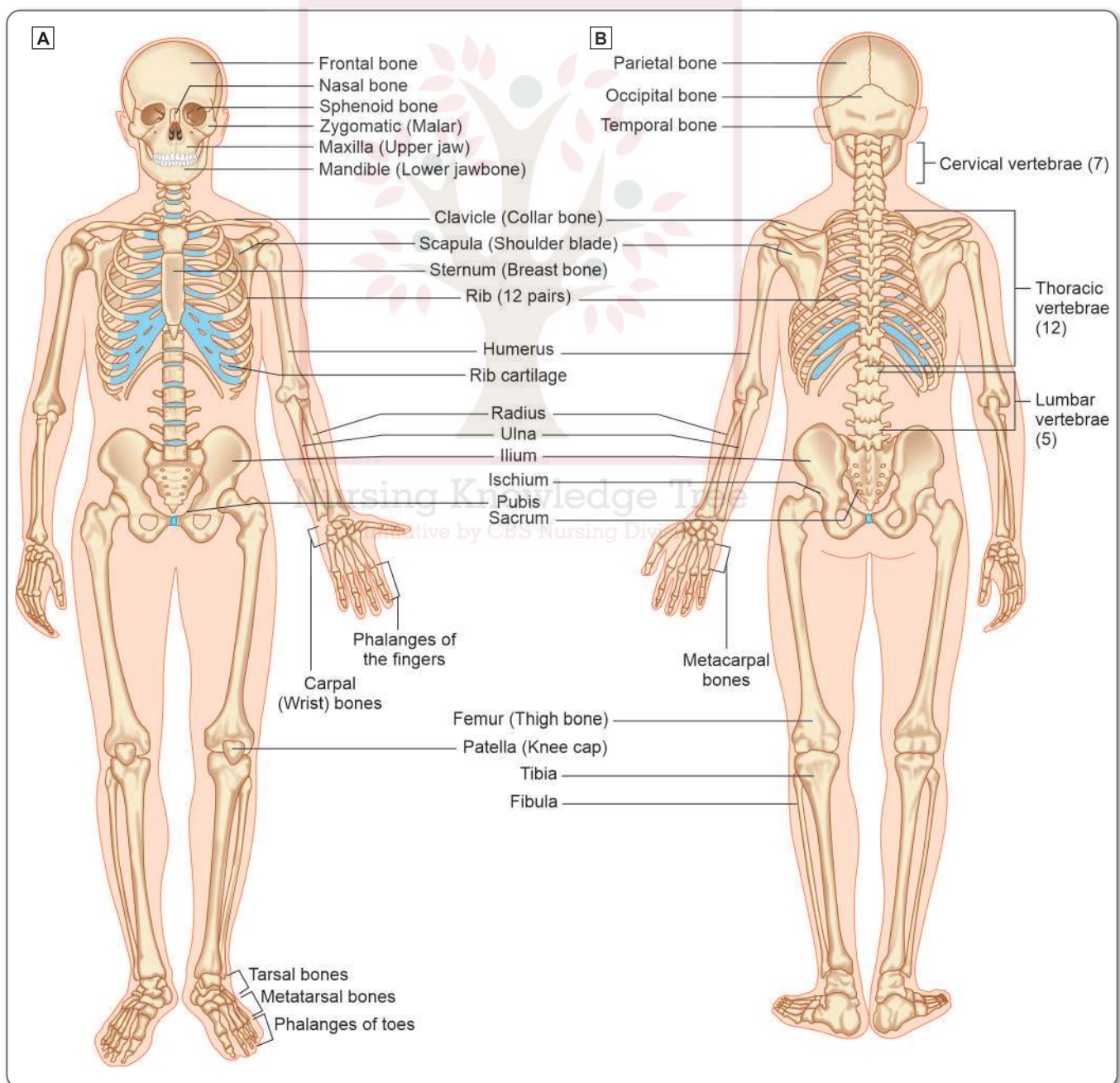
- **Flaccid neurogenic bladder**
 - Injury on lower motor neuron
 - Bladder won't contract forcefully. Leads to overflow incontinence.
- **Complications:** UTI, renal calculi, Vesicoureteral Reflux (VUR), renal failure
- **Management:** Catheterization and adequate fluid intake.

Vesicoureteral Reflex

- Retrograde or back flow of urine from bladder to ureter even sometimes to kidney is known as VUR.
- **Features of recurrent VUR:** UTI, palpable renal mass, and renal failure
- **Diagnosis:** Voiding cystourethrogram, uroflowmetry.

MUSCULOSKELETAL SYSTEM

ANATOMY AND PHYSIOLOGY OF MUSCULOSKELETAL SYSTEM



Figures 62A and B: Skeletal system of human body: A. Anterior view; B. Posterior view



CLASSIFICATION OF BONES

TABLE 46: Classification of bones with their numbers in human body

Sl. No.	Name	Number	Bone
Axial skeleton (80 bones)			
1	Cranial bones	8	Frontal bone-1 Parietal bones-2 Temporal bones-2 Occipital bone-1 Ethmoid bone-1 Sphenoid bone-1
	Facial bones	14	Zygomatic bones-2 Maxilla bones-2 Nasal bones-2 Lacrimal bones-2 Vomer bone-1 Palatine bones-2 Inferior nasal conchae-2 Mandible-1
2	Hyoid bone	01	Hyoid bone-1
3	Auditory ossicles	06	Malleus-2 Incus-2 Stapes-2
4	Rib cage	25	Ribs-24 Sternum-01
5	Vertebral column	26	Cervical vertebrae-7 Thoracic vertebrae-12 Lumbar vertebrae-5 Sacrum vertebra-1 Coccyx vertebra-1
Total			80 bones
Appendicular skeleton (126 bones)			
1	Shoulder girdle	4	Scapulae-2, Clavicle-2
2	Upper extremity	60	Humerus-2 (1 + 1) Radius-2 (1 + 1) Ulna-2 (1 + 1) Carpals-16 (8 + 8) Metacarpals-10 (5 + 5) Phalanges-28 (14 + 14)
3	Pelvic girdle	02	Innominate bones-2
4	Lower extremity	60	Femur-2 (1 + 1) Tibia-2 (1 + 1) Fibula 2 (1 + 1) Patella-2 (1 + 1) Tarsals-14 (7 + 7) Metatarsals-10 (5 + 5) Phalanges-28 (14 + 14)
Total bones			80 (Axial) + 126 (Appendicular) = 206

- There are 206 bones in human body.
- Among 206 bones, 80 bones are the part of axial skeleton which compose skull, vertebral column and thorax.
- 126 bones are the part of appendicular skeleton system.

- Based upon the shape, bones in the human body are classified into four categories.

TABLE 47: Types of bones on the basis of shape

Category	Description with example
Long bone ^{KPSC} <i>March 2023</i>	These are shaped like rods or shaft with rounded end, e.g., humerus, radius, ulna, femur, tibia, fibula, etc.
Short bone	They do not have long axis, they are cubical, e.g., carpals, tarsals
Flat bone	They protect the underlying structure and provide surface area for muscle attachment, e.g., sternum, skull
Irregular bone	These bones are having various shapes, e.g., vertebral column, ear ossicles, facial bone, pelvic bone



Key Points

- **Largest bone:** Femur
- **Smallest bone:** Stapes (Bone in the middle ear)
- **Total number of ribs:** 12 pairs
- **Most mobile joint:** Ball and socket joint. For example, shoulder joint.
- **Least stable joint:** Ball and socket joint.
- **Smallest vertebra:** Cervical
- **Only movable bone of the skull:** Mandible bone
- **Most prominent cartilage of the larynx:** Thyroid cartilage

REVIEW POINTS

- Osteoblasts vs osteoclasts vs osteocytes
 - Osteoblasts = stem cells that give rise to osteocytes = build bone.
 - Osteocytes = mature bone cells = reside in bones for housekeeping.
 - Osteoclasts = large cells that break down bone.
- Bones are classified as **long bones, short bones, flat bones and irregular bones.**
- Long bones include femur, tibia, fibula, radius, ulna, and humerus. They consist of a long, thin part called the **diaphysis, or shaft**, and two bulbous-type ends called the **epiphysis.**
- **Short bones are basically** cube-shaped as wide as they are long. For example, bones found in the wrist and ankle.
- **Flat bones** are thin and generally flat. Examples of flat bones are the cranial bones, which protect the brain, and the scapula (shoulder blade).
- **Irregular bones** include many of the bones that do not fall into the other three categories. They have complex shapes and include bones like the vertebrae.
- Bones are composed of **spongy and compact bone, periosteum and endosteum**, and a **medullary cavity.**
- The **periosteum** is a dense, white, fibrous sheath that covers the surface of the bone where muscles and tendons are attached.



“Man needs difficulties; they are necessary for health.”

—Carl Jung



MULTIPLE CHOICE QUESTIONS

(Including Explained and Practice Questions)

CARDIOVASCULAR SYSTEM

ANATOMY OF HEART

1. **Specialized cardiac muscles are present in layer of the heart.**
 - a. Epicardium
 - b. Myocardium
 - c. Endocardium
 - d. Pericardium
2. **Posterior surface of heart is formed by:**
 - a. RA
 - b. LA
 - c. LV
 - d. RV

Explanation: Posterior surface of the heart and base of the heart is formed by left atrium.

3. **Coronary sinus opens into:**
 - a. Inferior vena cava
 - b. Right atrium
 - c. Left atrium
 - d. Great cardiac vein
4. **What is the normal amount of pericardial fluid?**
 - a. 5–10 ml
 - b. 20–50 ml
 - c. 50–100 ml
 - d. 100–200 ml
5. **The heart valves are lined by layer of the heart.**
 - a. Epicardium
 - b. Myocardium
 - c. Endocardium
 - d. Pericardium
6. **Valve between left atrium and left ventricle is:**
 - a. Bicuspid valve
 - b. Tricuspid valve
 - c. Tetracuspid valve
 - d. Monocuspid valve

Explanation:

- Valve between left atrium and left ventricle is bicuspid valve which is also known as mitral valve.
- Valve between right atrium and right ventricle is tricuspid valve.
- Valve located between pulmonary artery and right ventricle is semilunar valve.
- Valve located between aorta and left ventricle is also known as semi-lunar valve.

7. **Valve responsible for murmurs which auscultates at the second left intercostal space along the left sternal border is:**
 - a. Aortic
 - b. Bicuspid
 - c. Pulmonic
 - d. Tricuspid
8. **The closure of the aortic valve in the arterial waveform is denoted by:**
 - a. Anaerobic notch
 - b. Dicrotic notch
 - c. Systolic notch
 - d. End diastolic point
9. **The arteries that supply the heart muscles are branches of the:**
 - a. Abdominal aorta
 - b. Thoracic aorta
 - c. Aortic arch
 - d. Ascending aorta

10. “Potential anastomosis” seen in:

- a. Labial branch of facial artery
- b. Intercostal artery
- c. Coronary artery
- d. Arterial arcades of mesentery

11. Identify the artery that carries deoxygenated blood

- a. Umbilical artery
- b. Pulmonary artery
- c. Both a and b
- d. Carotid artery

12. Blood supply to the heart is maintained by:

- a. Pulmonary
- b. Coronary
- c. Aorta
- d. Myocardial

13. Posterior communicating artery is branch of:

- a. Internal carotid artery
- b. External carotid artery
- c. Middle cerebral artery
- d. Posterior cerebral artery

14. Right coronary artery supplies all; except:

- a. Apex of heart
- b. Intraventricular septum
- c. Inter atrial septum
- d. SA node

15. Pacemaker of heart is:

- a. AV node
- b. SA node
- c. Purkinje fibers
- d. Parasympathetic system

(JIPMER 2012)

Explanation: Pacemaker of the heart is SA node. It is located in the wall of the right atrium.

16. Slowest conduction is in:

- a. SA node
- b. Purkinje fibers
- c. AV node
- d. Bundle of His

17. Distention and recoil of blood vessel during systole and diastole is achieved through the property of blood vessel.

- a. Peripheral vascular resistance
- b. Elasticity
- c. Diameter
- d. Smooth muscle contraction

18. Vasoconstriction leading to increased blood pressure is triggered by the following situation:

- a. Stimulation of the parasympathetic nerve supply.
- b. Stimulation of the cardioinhibitory center in the medulla.
- c. Increased levels of angiotensin II in the blood.
- d. Increased level of carbon dioxide in the blood.

19. Baroreceptors help in:

- a. Stimulating respiration
- b. Stimulating sweating
- c. Maintaining BP
- d. Stimulating thirst

20. Arterial supply to SA node is by:

- a. Left anterior descending coronary artery
- b. Posterior interventricular (descending) artery
- c. Left coronary artery
- d. Right coronary artery



Ans.

1. b
2. b
3. b
4. b
5. c
6. a
7. c
8. b
9. d
10. c
11. c
12. b
13. a
14. a
15. b
16. b
17. b
18. c
19. c
20. d