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Body Movements and Blood Circulation

Human Body and its Movements

Bones and muscles work together to cause movements in humans. But when we walk by using our legs, then we move our whole body from one place to the other place. The ability of human beings (or an animal) to move their body from one place to other, is called locomotion, e.g. walking, running, jumping, etc.

Human Skeleton

The bones and cartilages in our body form a framework that supports the whole body and gives a shape to it. This framework is called the skeleton. There are 206 bones is human skeleton.

Bones of Skeleton

The skeleton system consists of various bones. Some important bones are as follows.

Skull

It is the bony part of our head which is made up of 22 small bones. These are the hardest bones of our body. Some of these form cranium and some form the **facial bones**. All the bones of skull except the lower jaw are fixed.

Functions

- Skull protects the brain.
- It also protects the sense organs of face (eye, ears and nose).
- It gives shape to our face and head.

Ribcage

The ribs are the curved bones present in our chest region. There are 12 pairs of bones which form a cage-like structure as shown in the figure. One end of the bone joins the backbone, while other end joins the breast bone in the front.

Functions

- Ribcage protects vital internal organs like heart, lungs and liver.
- It takes part in our breathing movements along with the lungs.

Backbone

If we put finger at the back of the neck and move it pressing downwards, we feel long hard structure. This is our backbone which is long, hollow, rod-like structure running from the neck to the hips.

Scientifically, it is called **vertebral column.** It is made up of 33 small bones placed over each other. Each small bone is called **vertebrae**. Between the various vertebrae of backbone are the discs of cartilage (soft bone) which allow the vertebrae to move slightly and enable the backbone to bend forwards and downwards.

Functions

- Backbone provides main support to the body.
- It supports head at its top.
- It attaches along with it shoulder bones, ribs and hip bones.
- It gives protection to spinal cord.

Shoulder bones

Arms of our body are attached to shoulders. There are two shoulder bones, i.e collar bones and shoulder blades.

The upper arm fits into the socket of shoulder blade (forming ball and socket joint).

Functions

- Collar bones on the two sides of the neck keep our shoulders apart.
- Shoulder blades attach the arms to our body.
- Shoulder blades provide sites for muscle attachments which move the arms, neck and upper part of the body.

Pelvic bones

The pelvic bone forms a large, basin-shaped framework at the lower end of the backbone, to which the legs are attached. The pelvic bone is also known as **hip bone.** This bone encloses the portion of the body below the stomach. It is also the part of our skeleton, we sit on.

Functions

- Pelvic bones protects and supports the lower organs of the body like intestines, urinary bladder, internal sex organs, etc.
- It attaches the legs to our body.
- It provides sites for the attachment of muscles that move our legs, hips, trunk, etc.
- **Bones of the hand** Our hand is made up of the three parts, i.e. wrist, palm and fingers. The number of bones present in these parts are Wrist– 8 small carpals
- Palm– 5 long metacarpals
- Fingers– 3 bones in each finger called phalanges.
- Thumbs are made up of 2 bones each.

Cartilage

These are the additional parts of the skeleton that are not as hard as the bones and which can be bent. So, most of the skeleton is made of bones but it has some cartilage too. In fact cartilage is a kind of softer and elastic bone present in the following parts of our body.

(i) It is present in the pinna of ears (upper part).

(ii) It is present at the end of nose.

(iii) It is also present (as cartilage discs) between the vertebrae of backbone.

(iv) It is present on the end of bones where they meet one another at a joint.

Joints of the Body

We can bend our body part only at those points (places) where two or more bones are joined together such places in our body are called joints.

There are of following types

(i) Ball and Socket joints, e.g. hip and shoulder joints.

(ii) Pivotal joints, e.g. joint of head and neck.

(iii) Hinge joints e.g. elbow, knee, finger joints and jaw.

(iv) Fixed joints, joints the bones of skull.

Muscles

- It is a soft tissue consisting of muscle fibres. Muscles are attached to the bones of our skeleton. When the muscle attached to a bone **contracts**, it becomes shorter, stiffer and thicker. It pulls the bone due to which the bone moves at the joint.

- The muscles joined to our bones work in pairs. This is because a muscle can only pull a bone, it cannot push a bone. Thus, two muscles have to work together to move a bone.
- When one muscle of the pair contracts (or shortens), then the other muscle of the pair relaxes. To move the bone in the opposite direction, the relaxed muscle contracts to pull the bone towards its original position, while the first relaxes.
  e.g. the up and down movements of our arms are controlled by two muscle, i.e. biceps (flexor) and triceps (extensor). When we want to raise our arm, the **biceps** in front contract, i.e. they become shorter to pull up the arm. To lower the arm, the **triceps** at the back contract and pull it down.

Blood

- Blood is a fluid connective tissue and composed of blood corpuscles, plasma and platelets.
- It is slightly alkaline is nature (pH 7.4).
- Its volume in an adult is 5.8 L.
- The oxygenated or pure blood is bright red while the deoxygenated blood is purple coloured (Darker shade of red).
- People who live at high altitudes have more blood than those who live in low regions. This extra blood supplies additional oxygen to body cells.
- During blood clotting fibrinogen changes into fibrin by **thrombin** which is obtained from thrombop- lastin in the presence of Ca^{2+}.
- The haemoglobin content of adult female varies from 13.5-14.5% whereas in adult male its amount varies from 14.5-15.5% Haemoglobin count is highest in the foetus and is about 23 g per 100 mL of blood at birth.

Blood Vessels

Blood vessels are of three types

Arteries

- These are thick walled blood vessels which carry the blood away from the heart to various body parts. These are deep seated in the body and have no valves in them.
- These carry oxygenated blood except the pulmonary artery which carries deoxygenated blood to the lungs. In arteries, blood flows at a high pressure and a higher speed.

Veins

- These are thin walled blood vessels and carry blood away from various body parts towards the heart. These have valves in them to prevent back flow of blood in them. Blood flows at low pressure and at a lower speed.
- These carry deoxygenated blood except the pulmonary vein which carries oxygenated blood to the heart.

Capillaries

- These are the thinnest blood vessels and connect arteries to the veins.
- These help in exchange of materials like the nutrients, gases, waste products etc., between blood and cells.

Blood Cells

Erythrocytes (RBCs)

- Red blood cells contain the blood's haemoglobin and distribute oxygen.
- RBCs are the most abundant cells.
- Mature red blood cells lack a nucleus and organelles in mammals. However, in camel and llama it is nucleated.
- One RBC contains about 280 haemoglobin molecules.

Leukocytes (WBCs)

These are part of the body's immune system; they destroy and remove old or aberrant cells and cellular debris, as well as attack infectious agents and foreign substances. These are much less in number than RBCs (1 : 600).

Thrombocytes (Platelets)

It is responsible for blood clotting (coagulation). It changes fibrinogen into fibrin.

Blood Pressure (BP)

- The pressure created by the blood on the walls of the blood vessels due to the repeated pumping of heart is called **blood pressure**. It is measured by **sphygmomanometer.**
- It can be felt at certain places in our body *viz*, wrist of the hands etc.
- Blood pressure is recorded as systolic/diastolic. Blood pressure in a normal person is 120 / 80 mmHg. Factors affecting blood pressure are age, cardiac output, total peripheral resistance etc.
- If a person has persistent high blood pressure then it is called **hypertension** and persistent high blood pressure is 150/90 mm Hg. Factors responsible are over eating, fear, worry, anxiety, sorrow etc. **Hypotension** is condition of low blood pressure, *i.e.*, persistent 100/50 mm Hg.
- **Electrocardiograph** (ECG) is used to check proper working of heart by using electrodes.

Practice Exercise

1. Which of the following parts of our body help us in movement?
(i) Bones (iii) Skin
(ii) Muscles (iv) Organs
Choose the correct answer form the option below.
(a) (i) and (iii) (b) (ii) and (iv)
(c) (i) and (iv) (d) (ii) and (iii)

2. The organ that protects the main nerve cord is
(a) skull (b) backbone
(c) breast bone (d) chest bone

3. How many muscles work together to move a bone?
(a) One (b) Two
(c) Three (d) Four

4. Human skeleton comprises
(a) skull and backbone
(b) ribs and breast bone
(c) shoulder and hip bone
(d) All of the above

5. Which one of the following is the characteristics of birds?
(a) Strong muscles (b) Light bones
(c) Hollow bones (d) All of these

6. Skeleton of human body is made up of
(a) bones (b) cartilage
(c) Both (a) and (b) (d) None of these

7. Fixed joints are found in
(a) lower jaw (b) skull
(c) hands (d) hip bone

8. Knee joints are
(a) hinge joints
(b) ball and socket joints
(c) pivotal joints
(d) fixed joints

9. The bone formed from the collar bone and shoulder bone is
(a) shoulder bone (b) chest bones
(c) hand bones (d) backbone

10. The joint in cranium is a
(a) gliding joint
(b) ball and socket joint
(c) fixed joint
(d) hinge joint

11. The delicate internal organ which is not protected by the ribcage is
(a) heart (b) brain (c) liver (d) lungs

12. Which of the following joints is immovable?
(a) Shoulder and arm
(b) Knee and joint
(c) Upper jaw and skull
(d) Lower jaw and upper jaw

13. The blood is a .....
(a) soft tissue (b) connective tissue
(c) fluid tissue (d) Both (b) and (c)

14. The RBCs are nucleated in vertibrates except.
(a) Frog (b) tod
(c) Mammals (d) None of these

15. The life span of WBC is
(a) 120 days (b) 10-12 hours
(c) 4-5 days (d) None of these

16. Which of the following type of WBC is phagocytic as nature?
(a) Neutrophils (b) Basophills
(c) Eosinophils (d) Monocytes

17. CO_2 is transported as
(a) dissolved in blood plasma
(b) carbonic acid
(c) carbamino haemoglobin
(d) Both (b) and (c)

18. If a sample of blood shows clumping with antiserum-A but not with antiserum-B, then it is group
(a) A (b) B
(c) AB (d) O

19. Most of the CO_2 is carried in blood as
(a) bicarbonates (b) carbon monoxide
(c) carbonic acid (d) carbonates

20. The life span of human WBC is approximately
(a) less than 10 days
(b) between 20 to 30 days
(c) between 2 to 3 months
(d) more than 4 months

21. Erythrocytes of adult mammals are formed in
(a) kidney (b) liver
(c) bone marrow (d) spleen

22. Read the following statements and choose the correct option for true statements.
I. Rib case has 14 pairs of bones.
II. Skull is bony part of head which contains 22 small bones.
III. Femar is the largest and strongest bone of the human body.

Options
(a) III is false, I, II are true
(b) I is false, II, III and true
(c) II is false, I, III and true
(d) All are true

23. Fill the appropriate words in the blanks—
Blood is a specilised ..... tissue. It has three types of cells namely ....., ..., ... The liquid part of the blood with cells is called .....
(a) connective, RBC, WBC, platelets, plasma
(b) plasm, WBC, RBC, platelets, connective
(c) masular, platelets, WBC, RBC, plasma
(d) None of the above

24. The condition of human blood in which the haemoglobin content becomes less is called ..... It is a result of deficiency of ..... and .....
(a) anaemia, Fe, B_{12} (b) leukemia, Fe, B_1
(c) anaemia Fe, B_6 (d) anaemia Fe, B_5

Answers

1	*(a)*	2	*(b)*	3	*(b)*	4	*(d)*	5	*(d)*	6	*(c)*	7	*(b)*	8	*(a)*	9	*(a)*	10	*(c)*
11	*(b)*	12	*(c)*	13	*(d)*	14	*(c)*	15	*(b)*	16	*(a)*	17	*(d)*	18	*(a)*	19	*(a)*	20	*(d)*
21	*(c)*	22	*(b)*	23	*(a)*	24	*(a)*												