

Students Learning Outcomes

After Studying this chapter, students will be able to:

- Describe the roles of the parts of the air passageway and lungs.
- Describe the mechanism of breathing in terms of movements of ribs and diaphragm.
- Differentiate between the composition of inspired and expired air.
- Discuss briefly diseases related to respiratory system like bronchitis, emphysema, pneumonia, asthma, and lung cancer.

Subjective Type Questions

Long Questions prepared in the light of new Examination Techniques
(Knowledge, Understanding, Application, Analytical & Conceptual)

Q1. Distinguish between cellular respiration, gaseous exchange and breathing.

Ans. Cellular respiration:

Cellular respiration is a process in which cells oxidize food (glucose) and get energy.

- For this purpose, organisms need to carry oxygen to their cells and to remove carbon dioxide from cells.
- Cellular respiration is a chemical process.
- Cellular respiration takes place inside every cell.

Gaseous Exchange:

Gaseous exchange is the process in which oxygen present in the inhaled air (in lungs) moves into blood and carbon dioxide from the blood moves into the air to be exhaled.

- For gaseous exchange, animals do breathing.
- Gaseous exchange helps in respiration.

Q. What are product aerobic respiration.

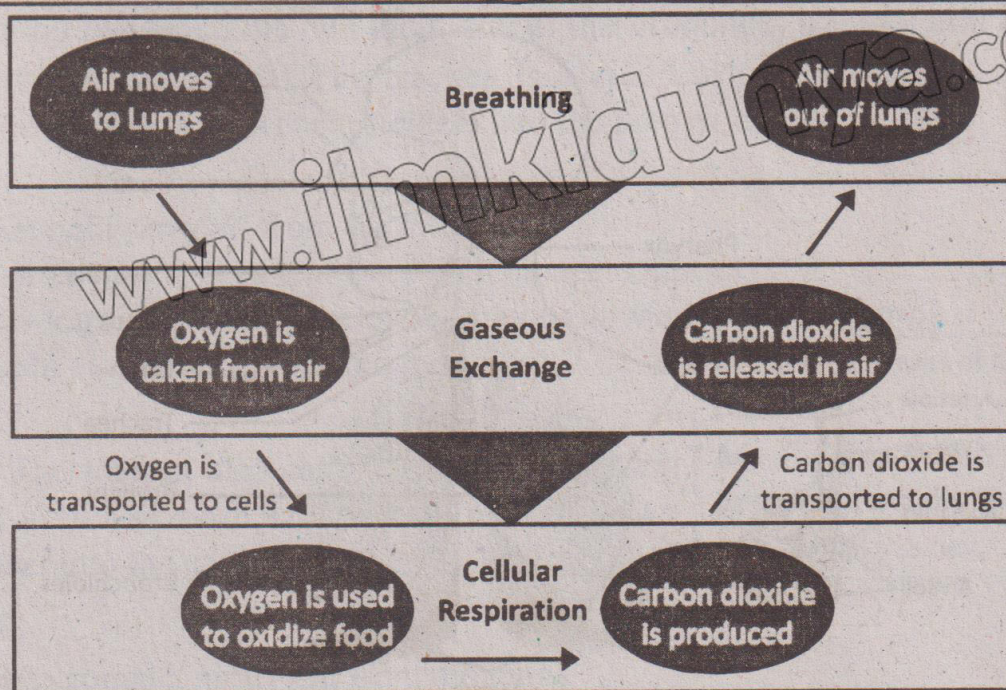
Ans. In aerobic respiration, oxygen is utilized while carbon dioxide and water are produced

Breathing:

Breathing is the process in which animals move air into and out of their body.

It is done to get oxygen from air and to release carbon dioxide in it. Breathing and respiration are not the same process.

- Breathing is a physical process while respiration is a chemical process.
- Breathing helps in gaseous exchange. Gaseous exchange in turn helps in respiration.



Relationship between respiration, gaseous exchange and breathing

2.1

Human Respiratory System

Q2. Write a short note on the major parts of the human air passageway.

Ans. Human respiratory system is responsible for breathing and gaseous exchange. The human respiratory system consists of two major parts.

- Air Passageway
- Lungs

Air Passageway:

When air enters the body, it passes through connected tubes to reach the lungs. After gaseous exchange, air moves from the lungs to outside through the same connected tubes. These connected tubes are collectively called air passageway. It consists of the following parts.

(i) Nostrils and Nasal cavity:

The nasal cavity is made up of two narrow cavities between nostrils and pharynx. Air enters the nasal cavity through nostrils.

Role of Fine hairs: Fine hairs in nasal cavity filter the incoming air by trapping large dust particles.

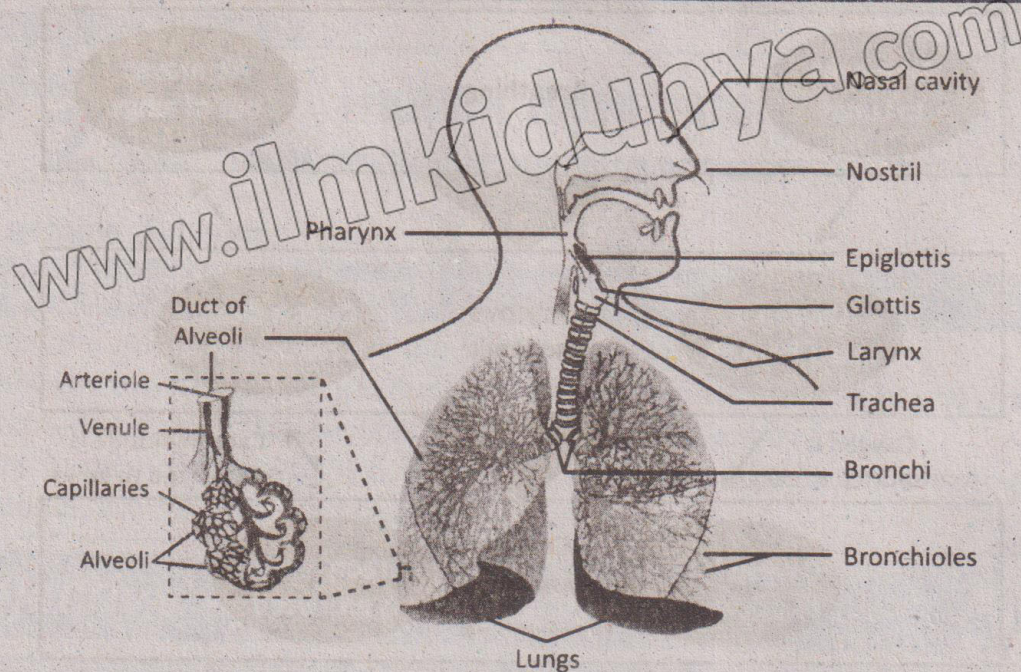
Role of Mucus: Mucus on the walls of nasal cavity traps small dust particles. Mucus also warms the air and keeps its temperature nearly equal to the temperature of body.

Q. Which is common passage for food and air?

Ans. Pharynx is a common passage for food to oesophagus and for air to larynx.

Q. How sound is produced?

Ans. The vibrations of vocal cords and the movements of lips, cheeks, tongue and jaws produce specific sounds which result in speech.



The air passageway and the lungs

(ii) Pharynx: Nasal cavity opens into pharynx.

Glottis: At the floor of pharynx there is an opening called glottis. It opens in larynx.

Epiglottis: The glottis is guarded by a flap called epiglottis.

Role of epiglottis: It prevents food and liquid from entering the windpipe and lungs.

(iii) Larynx:

Larynx is a box present between pharynx and trachea. Larynx is also called the voice box.

Sound production: Two fibrous bands called vocal cords are attached to the inner walls of larynx. The vibration of vocal cords produce sound.

(iv) Trachea and Bronchi:

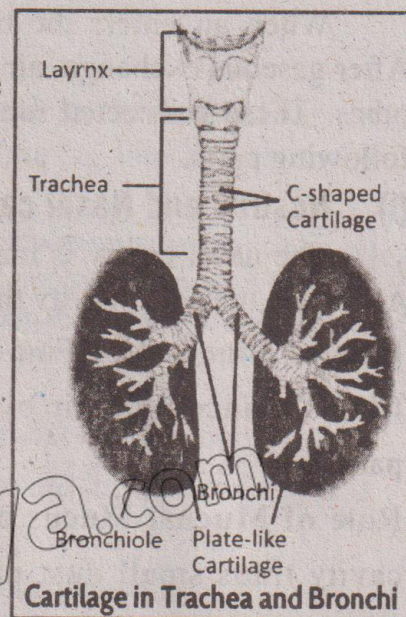
Trachea (windpipe) is a 12 cm (4.72 inches) long tube attached with larynx. It ends in two branches called bronchi. Each bronchus enters into the lung of its side.

The inner walls of trachea and bronchi are lined with mucus and cilia.

Role of mucus and cilia: Mucus traps fine dust particles and bacteria. Cilia moves the dust particles and mucus upwards to the pharynx.

(v) Bronchioles and Alveoli: Inside lungs, both bronchi continue to divide into very small tubes called bronchioles. Each bronchiole ends at an alveolar duct. This duct opens into a cluster of pouches. These thin-walled pouches are called alveoli.

When air reaches alveoli, oxygen moves from the air into blood and carbon dioxide passes out of blood into the air in the alveoli.



Q3. Describe the functions and locations of the bronchus, trachea and alveoli.

Ans. Bronchus Location: The trachea is divided in two branches called bronchi (singular: bronchus) each bronchus enters into the lung of its side.

Functions:

- The bronchi carry air from the trachea.
- The inner walls of bronchi lined with cilia and mucus.
- Mucus traps fine dust particles and mucus upward to the pharynx.
- Bronchi also helps in regulating air flow.

Q. How many pairs of ribs make up the chest wall?

Ans. The chest wall is made up of 12 pairs of ribs and the rib muscles called inter-coastal muscles.

Trachea:

Location: The trachea also called windpipe is a long tube that attached with larynx and passes down through next into the chest cavity.

Functions:

- Trachea conduct air to and from the lungs.
- In the walls of trachea C-shaped cartilages are present. Which prevent it from collapsing and keep the airway open.
- The inner walls of trachea have cilia and mucus that trap dust. Particles and move them upward.

Alveoli:

Location: Alveoli are the thin-walled pouches present at the end of bronchioles inside the lungs.

Functions: Alveoli are the main sites of gaseous exchange. When air reaches alveoli, oxygen moves from the air into blood and carbon dioxide passes out of blood into the air in the alveoli.

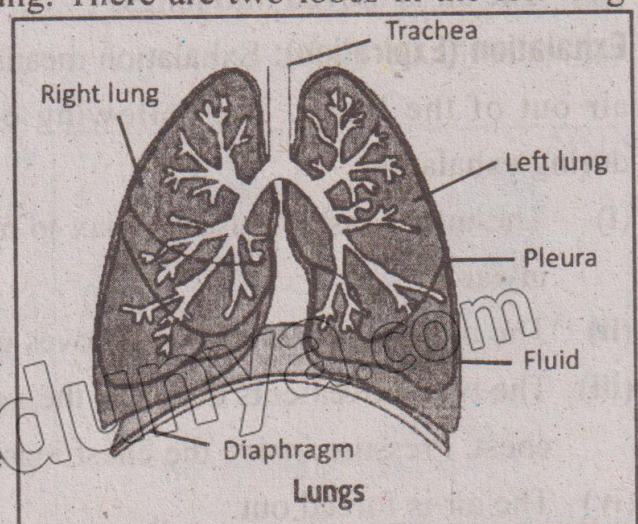
Q4. Describe the structure of lungs.

Ans. Lungs:

There is a pair of lungs in the thoracic cavity. Lungs are spongy and elastic organs. The left lung is slightly smaller than the right lung. There are two lobes in the left lung while right lung has three lobes.

Diaphragm: Diaphragm is the thick muscular structure below the lungs.

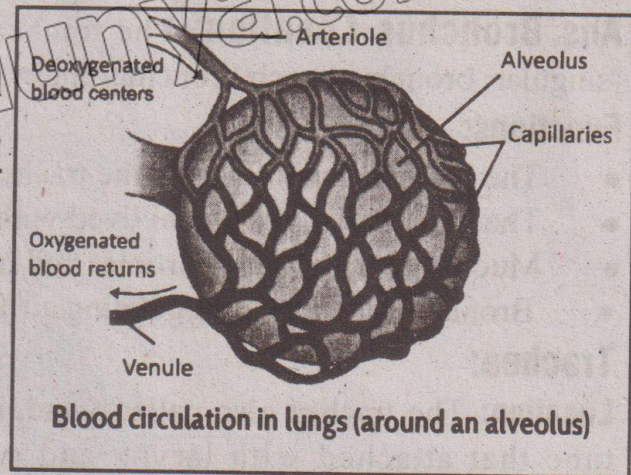
Membranes of lungs: Lungs are enclosed in a double membrane called pleura. Its inner layer is attached to the surface of the lungs while the outer layer lines the inner surface of the chest wall and the diaphragm. It contains a pleural fluid for reducing friction between lungs and the chest wall.



Q5. How blood circulate through lungs?

Ans. Blood circulation in lungs:

Pulmonary artery carries deoxygenated blood from heart to lungs. Inside each lung, the pulmonary artery divides into smaller arterioles. The arterioles divide further and make capillaries around the alveoli. After surrounding the alveoli, the capillaries join to form venules. The venules join to form pulmonary vein which carries oxygenated blood back to heart.



2.2

The Mechanism of Breathing

Q6. Explain the process of inhalation and exhalation step by step.

Ans. Breathing: Breathing is a physical process in which air is taken into the lungs and expelled out the lungs.

Phases of breathing: There are two phases of breathing.

- (i) Inhalation (ii) Exhalation

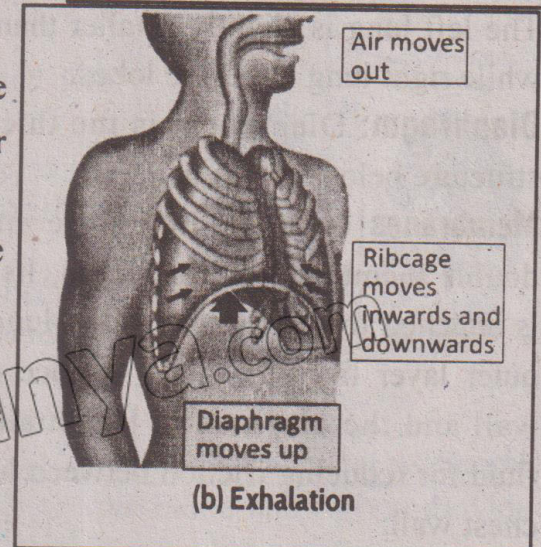
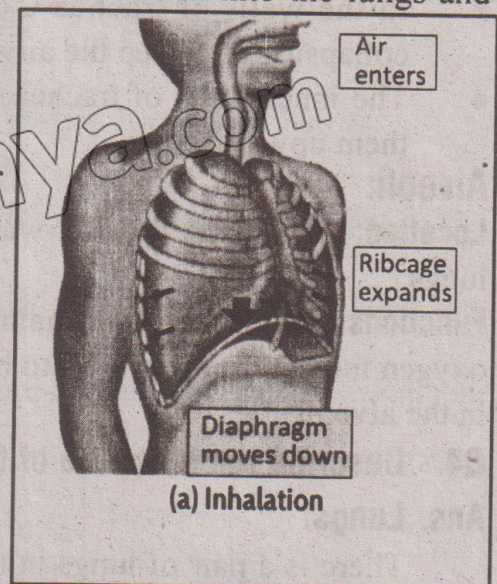
Inhalation (Inspiration): Inhalation means intake of air to the lungs. The following events occur during inhalation.

- (i) The intercostal muscles (muscles located between the ribs) contract to expand the ribcage.
- (ii) At the same time, diaphragm also contracts and moves down.
- (iii) These two contractions increase the volume of the chest. Pressure inside the chest cavity is reduced.

- (iv) The air is moved into lungs.

Exhalation (Expiration): Exhalation means moving the air out of the lungs. The following events occur during exhalation:

- (i) The inter costal muscles relax to move ribcage inwards.
- (ii) The diaphragm relaxes and moves up.
- (iii) The two movements decrease the volume of the chest. Pressure inside the chest increases.
- (iv) The air is forced out.



Q7. Describe the breathing rate at rest and during exercise.

Ans. Breathing Rate at rest: Humans breathe 16-20 times per minute in normal conditions i.e., at rest.

Breathing rate during exercise: During exercise or hard job, muscles carry out cellular respiration at

greater rate. So, more carbon dioxide is produced. The respiratory centre in brain detects greater concentration of carbon dioxide in blood. It sends messages to the muscles of ribs and diaphragm at greater speed. The speed of contraction and relaxation of these muscles increases. So, the breathing rate increases up to 30-40 times per minute.

Q8. What are the differences in composition between inhaled and exhaled air?

Ans. Composition of the Inhaled and the Exhaled Air

Feature	Inspired Air	Expired Air
Oxygen %age	21	16
Carbon dioxide %age	0.04	4
Nitrogen %age	79	79
Water vapours	Variable	Saturated
Temperature	Variable	Almost equal to body temperature
Dust particles	Variable	Almost none

2.3 Respiratory Disorders

Q9. What is bronchitis? Write down its types, causes symptoms and treatments.

Ans. Bronchitis: Bronchitis means inflammation (swelling) in bronchi or bronchioles. In bronchitis, the inner space of bronchioles decreases.

Types of bronchitis:

(i) Acute bronchitis (short term)

(ii) Chronic bronchitis (long term)

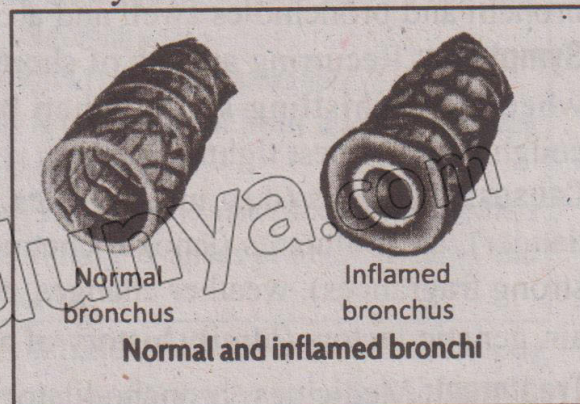
Acute bronchitis: The acute bronchitis usually lasts about two weeks and patient recover with no permanent damage to the bronchi or bronchioles.

Chronic bronchitis: In chronic bronchitis, mucus producing cells in the walls of bronchi increase in number. Thus, there is thick mucus in bronchi. It obstructs the inhaled and exhaled air. It usually lasts for at least three months to two years.

Causes of bronchitis: Infections by viruses or bacteria, chemical irritants (e.g. tobacco smoke) are the causes of bronchitis.

Symptoms: Coughing, wheezing, fever, chills and shortness of breath are the symptoms of bronchitis.

Treatment: Medications (cough suppressants) to ease breathing, antibiotics, antiviral medicines and avoiding irritants like smoke and pollution.



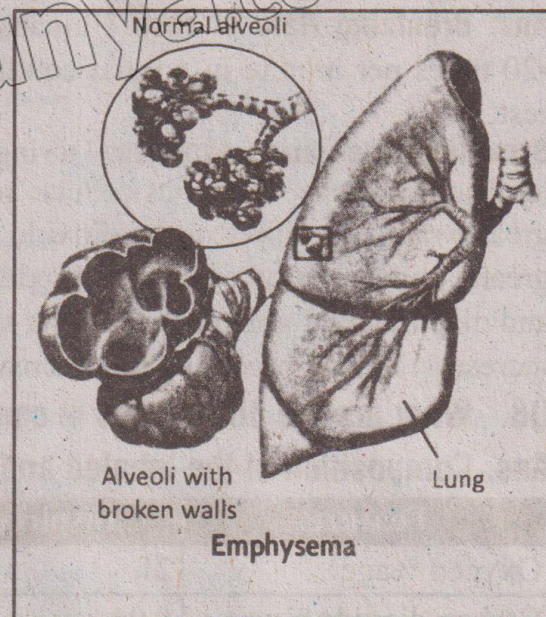
Q10. Write a note on emphysema.

Ans. Emphysema: In emphysema, the inner walls of alveoli become weak and then rupture. Thus, one larger air space is created instead of many small ones. So, the space for gaseous exchange decreases and the patient cannot inhale properly.

Causes of emphysema: Long-term exposure to irritants in air e.g., tobacco smoke, chemical fumes and other air pollutants.

Symptoms: Shortness of breath, chronic cough, (with or without mucus) wheezing and chest tightness.

Treatment: Medicines to relieve cough and breathing problems. Emphysema cannot be cured completely.



Q11. Discuss how the pneumonia is a respiratory disorder?

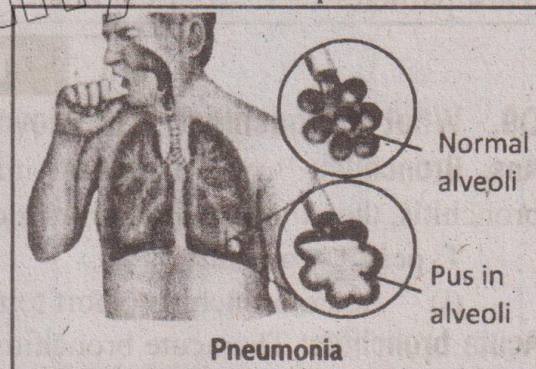
Ans. Pneumonia:

Pneumonia is an inflammation in the lungs, due to infection in alveoli. In pneumonia, the alveoli are filled with pus.

Causes: Infections by bacteria, viruses or fungi are the common causes of pneumonia.

Symptoms: The pneumonia patient suffers from high fever, chills, shortness of breath, and cough with sputum.

Treatment: Bacterial pneumonia is treated by using antibiotics. The viral and fungal pneumonia are treated by using antiviral and antifungal drugs. Bacterial vaccines are also available to prevent bacterial pneumonia.



Q12. Describe the changes that occurs in the bronchial tubes during asthma attack.

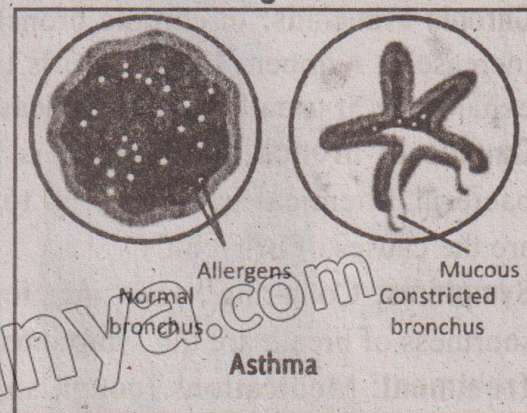
Ans. Asthma:

It is an inflammation of bronchi in which bronchi and bronchioles swell and are constricted.

Symptoms: Recurring attacks of shortness of breath, wheezing (whistling sound when breathing out), coughing and chest tightness.

Causes: Allergens (dust mites, pollen, mold, and pet dander), air pollutants (smoke, chemical fumes, and strong fragrances), weather changes, especially cold air, genetic factors (family history of asthma or allergies).

Treatment: Medicines (bronchodilators) to dilate bronchioles during asthma attack.



Q13. What is lung cancer? Describe its causes symptoms and treatment.

Ans. Lung Cancer: Cancer means uncontrolled increase in the number of cells in any part of the body. When the masses of non-functional cells are formed in lungs, it is called lung cancer. It is the most common cancer in the whole world.

Causes: Carcinogens (such as those in tobacco smoke), ionizing radiation, viral infection. Passive smoking i.e., the inhalation of smoke from another's smoking is also a cause of lung cancer. The smoke from the upper burning portion of cigarette is more dangerous than smoke exhaled by the smoker.

Symptoms: The most common symptoms are shortness of breath, coughing (including coughing up blood), and weight loss.

Treatment: The patient of lung cancer is given one or more treatments, including surgery, chemotherapy, or radiation therapy.

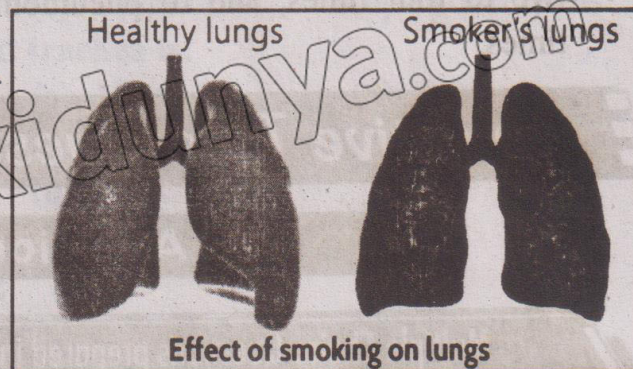
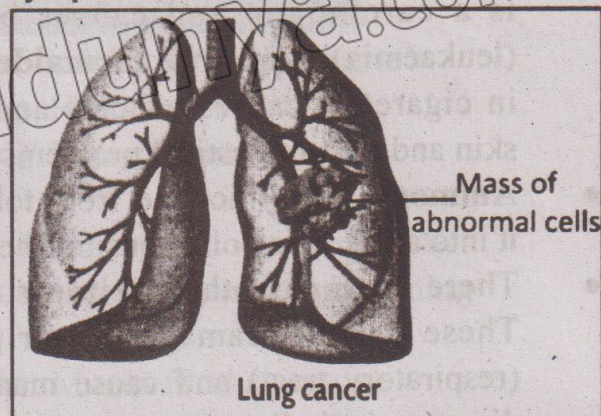
Q14. Describe effects of smoking.

Ans. Effects of Smoking:

Smokers have a much higher risk of developing life-threatening diseases. The most important risk of smoking is the abnormalities and cancers in lungs, kidneys, oral cavity, larynx, breast, bladder, oesophagus, pancreas and stomach.

Tobacco smoke contains over 4,000 different chemicals e.g, nicotine and carbon monoxide. Out of these, there are more than 69 known carcinogens (cause cancer in humans). For example tar and benzene.

- **Nicotine** is the major component of cigarettes. It damages many tissues including brain. It also hardens the walls of arteries and results in heart problem.
- **Carbon monoxide** is produced when tobacco is burnt during smoking. It is a poisonous gas. It combines with RBCs and prevents oxygen transport.
- **Tar** is present in cigarettes in the form of solid particles. When it is inhaled along with smoke, it is deposited in lungs. It reduces the surface area for gaseous exchange.



Q. What do you know about lung cancer?

Ans. Lung cancer is the most frequently diagnosed cancer globally, accounting for about 12.4% of all new cancer cases. In the world, it causes more than 1.5 million deaths annually. In Pakistan, lung cancer accounts for about 5.1 % of all new cancer cases annually. There are about 22,000 new lung cancer cases each year.

Source: World Health Organization

Q. What is probability of heart diseases and lung cancer in non smokers?

Ans. Non-smokers who inhale the smoke of others have 30% more chances of heart diseases and lung cancer.

- **Benzene** is a major component of cigarettes. It is a carcinogen and causes blood cancer (leukaemia). Similarly, **formaldehyde** present in cigarettes causes cancers and respiratory, skin and gastrointestinal problems.
 - **Ammonia** frees nicotine from tobacco turning it into a gas. It is poisonous for the body.
 - There are many other **irritants** in cigarettes. These irritants damage the air passageways (respiratory tract) and cause many respiratory diseases, including cancer.
- Smoking also increases blood cholesterol levels, blood pressure. It weakens blood vessels. Smoking causes the staining of teeth and bad breath. Tooth loss is 2 to 3 times higher in smokers than in non-smokers.
- Smoking increases the risk of tuberculosis by two to four times, and of pneumonia by four times.

Q. What is ratio of adult smoker in Pakistan?

Ans. In Pakistan, 12% of adults do smoking. 7.6% of all deaths in Pakistan are caused by tobacco use.

Q. What is vaping? Write its effects.

Ans. Vaping refers to inhaling vapor produced by an e-cigarette. These devices heat a liquid, which may contain nicotine, flavours, and other chemicals.

Many young people are attracted to vaping. They believe it a safer alternative to cigarettes, though this is not true.

Vaping can cause lung inflammation and lung injury. Nicotine and other chemicals in vape increase heart rate and blood pressure, contributing to heart disease.

Q. When the World No Tobacco Day is celebrated?

Ans. The World No Tobacco Day is celebrated on the 31st of May every year.

Objective Type Questions

Additional MCQ's

Multiple Choice Questions prepared in the light of new Examination Techniques
(Knowledge, Understanding, Application, Analytical & Conceptual)

- Organisms get energy by doing:**

(a) Transpiration	(b) Breathing
(c) Gaseous exchange	(d) Cellular respiration
- Which of the following is a by product of aerobic respiration?**

(a) Oxygen	(b) Glucose
(c) Carbon dioxide and water	(d) Nitrogen
- The process of taking in oxygen and removing carbon dioxide from cells is known as:**

(a) Breathing	(b) Oxidation	(c) Gaseous Exchange	(d) Digestion
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- Through which process animals move air into and out of the body?**

(a) Oxidation	(b) Breathing	(c) Reduction	(d) Transpiration
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- Respiration is a process:**

(a) Chemical	(b) Physical	(c) Mechanical	(d) Biological
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6. The human respiratory system consists of which two major parts?
(a) Nasal cavity and trachea (b) Heart and lungs
(c) Air passageway and lungs (d) Ribs and diaphragm
7. Where is carbon dioxide produced?
(a) In the air passageway (b) During cellular respiration
(c) Outside the lungs (d) In the mechanical breathing
8. Role of fine hairs in nostrils is:
(a) Filter the air (b) Mucus Production
(c) Protection (d) Warms the air
9. The function of mucus in the nasal cavity:
(a) Traps dust particles (b) Filter the air
(c) Warms the air (d) Protection
10. Nasal cavity opens into:
(a) Larynx (b) Bronchi (c) Trachea (d) Pharynx
11. At the floor of pharynx there is an opening called:
(a) Trachea (b) Glottis (c) Epiglottis (d) Vocal cords
12. The box present between pharynx and trachea is:
(a) Bronchi (b) Alveoli (c) Nasal cavity (d) Larynx
13. Pharynx is a common passage for:
(a) Taste and smell (b) Food and air
(c) Breathing and respiration (d) Food and water
14. The vibration of vocal cords produce:
(a) Heat (b) Cold (c) Saliva (d) Sound
15. The length of trachea is:
(a) 10cm (b) 12cm (c) 14cm (d) 16cm
16. Each bronchus enters into the:
(a) Heart (b) Alveoli (c) Pharynx (d) Lung
17. The inner walls of trachea and bronchi are lined with:
(a) Mucus (b) Cilia (c) Both a and b (d) Flagella
18. The cartilaginous rings in the wall of trachea are:
(a) U-shaped (b) V-shaped (c) N-shaped (d) C-shaped
19. What do the bronchi divide into once they are inside the lungs?
(a) Trachea (b) Alveolar ducts (c) Bronchioles (d) Pharynx
20. Each bronchiole ends at a specific opening called the:
(a) Alveolar duct (b) Lungs cavity (c) Diaphragm (d) Bronchus
21. What are the thin walled pouches at the end of the alveolar ducts called:
(a) Capillaries (b) Alveoli (c) Lobes (d) Branches
22. Which structures surround the alveoli to facilitate gas exchange?
(a) Rib muscles (b) Cartilage ring (c) Blood capillaries (d) Pleural fluid

23. How many pairs of ribs are present in the chest cavity?
(a) 8 (b) 12 (c) 16 (d) 20
24. Rib muscles are called:
(a) C-shaped cartilages (b) Inter-coastal muscles
(c) Spongy muscles (d) Elastic muscles
25. Where is the pair of lungs located in the human body?
(a) Abdominal Cavity (b) Pelvic cavity
(c) Thoracic cavity (d) Cranial cavity
26. What is the name of the thick muscular structure located below the lungs?
(a) Pleura (b) Diaphragm (c) Alveolus (d) Trachea
27. Lungs are:
(a) Hard and rigid (b) Spongy and elastic
(c) Liquid and smooth (d) Hollow and thin
28. How many lobes are present in the right lung?
(a) One (b) Two (c) Three (d) Four
29. How many lobes are present in the left lung?
(a) One (b) Two (c) Three (d) Four
30. What is the purpose of pleural fluid found between the lung membranes?
(a) To carry oxygen (b) To reduce friction
(c) To filter dust (d) To warm the air
31. Capillaries around the alveoli join together to form:
(a) Arteriales (b) Venules (c) Bronchioles (d) Pleura
32. The Venules carry oxygenated blood back to the:
(a) Lungs (b) Kidneys (c) Stomach (d) Heart

2.2

The mechanism of breathing

33. The Physical movements for taking air to lungs and then removing air from lungs are called as:
(a) Respiration (b) Photosynthesis (c) Transpiration (d) Breathing
34. During inhalation the inter-Coastal muscles and diaphragm:
(a) Move upward (b) Move inward (c) Contract (d) Relax
35. During inhalation the volume of chest cavity:
(a) Decreases (b) Increases (c) Remains same (d) No change
36. During exhalation:
(a) Inter-coastal muscles relax (b) Diaphragm relax
(c) Volume of chest cavity decreases (d) All of these
37. Human breathing rate per minute at rest is:
(a) 11-15 (b) 16-20 (c) 21-25 (d) 26-30
38. During exercise the breathing rate increase up to:
(a) 10-15 times (b) 20-25 times (c) 30-40 times (d) 35-45 times
39. The amount of oxygen in inspired air is:
(a) 16% (b) 20% (c) 19% (d) 21%

40. Percentage of oxygen in expired air is:
(a) 16% (b) 20% (c) 25% (d) 34%
41. Amount of carbon dioxide in expired air is:
(a) 21% (b) 4% (c) 16% (d) 0.04%
42. The percentage of nitrogen in both inspired and expired air is:
(a) 21-4 (b) 79-79 (c) 21-0.04 (d) 0.04-4

2.3

Respiratory Disorders

43. The inflammation in bronchi and bronchioles refers to:
(a) Pneumonia (b) Emphysema (c) Bronchitis (d) Asthma
44. Acute bronchitis lasts upto:
(a) One week (b) Two weeks (c) Three weeks (d) Four days
45. Mucus-producing cells increase in which type of bronchitis:
(a) Acute (b) Chronic (c) Both (d) None of these
46. Chronic bronchitis lasts for:
(a) Days (b) Weeks (c) Months (d) Years
47. Emphysema effects the:
(a) Bronchi (b) Alveoli (c) Lungs (d) Air passageway
48. Pneumonia is an infection of:
(a) Kidneys (b) Heart (c) Lungs (d) Blood
49. If both lungs are infected the disease is called:
(a) Typhoid (b) Double pneumonia
(c) Gout (d) Arthritis
50. Pneumonia may be caused by:
(a) Bacteria (b) Viruses (c) Fungi (d) All of these
51. Inflammation of bronchi in which bronchi and bronchioles swell and are constricted is:
(a) Lung cancer (b) Bronchitis (c) Emphysema (d) Asthma
52. Allergens are:
(a) Dust mites (b) Pollens
(c) Pet dander and mold (d) All of these
53. Allergens, Pollutants, weather changes and genetic factors are the causes of:
(a) Lung Cancer (b) Asthma (c) Bronchitis (d) Emphysema
54. The uncontrolled increase in the number of cells in any part of the body is called:
(a) Asthma (b) Malaria (c) Pneumonia (d) Cancer
55. Carcinogens are especially present in:
(a) Perfumes (b) Dust (c) Pet dander (d) Tobacco smoke
56. The inhalation of smoke from another's smoking is called:
(a) Active smoking (b) Passive smoking (c) Cancer (d) None of these
57. Tobacco smoke contains chemicals:
(a) 1000 (b) 2000 (c) 3000 (d) 4000

58. Out of 4000 how many tobacco smoke chemicals are carcinogens?
 (a) More than 50 (b) More than 60 (c) More than 40 (d) More than 69
59. Major component of cigarette is:
 (a) carbon dioxide (b) Carbon monoxide
 (c) Benzene (d) Nicotine
60. Tar is present in cigarettes in the form of:
 (a) Solid (b) liquid (c) Gas (d) Plasma
61. When the world NO Tobacco Day is celebrated?
 (a) 15th June (b) 27th March (c) 31st May (d) 25th February
62. How many time the risk of tooth loss increases in smokers than in non-smokers?
 (a) 2-3 times (b) 2-4 times (c) 3-4 times (d) 1-3 times
63. Smoking increase the risk of tuberculosis by:
 (a) Three times (b) Four times (c) Five times (d) Two times

Answers

- | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|
| 1. (d) | 2. (c) | 3. (c) | 4. (b) | 5. (a) | 6. (c) | 7. (b) |
| 8. (a) | 9. (c) | 10. (d) | 11. (b) | 12. (d) | 13. (b) | 14. (d) |
| 15. (b) | 16. (d) | 17. (c) | 18. (d) | 19. (c) | 20. (a) | 21. (b) |
| 22. (c) | 23. (b) | 24. (b) | 25. (c) | 26. (b) | 27. (b) | 28. (c) |
| 29. (b) | 30. (b) | 31. (b) | 32. (c) | 33. (d) | 34. (c) | 35. (b) |
| 36. (d) | 37. (b) | 38. (c) | 39. (d) | 40. (a) | 41. (b) | 42. (b) |
| 43. (c) | 44. (b) | 45. (b) | 46. (d) | 47. (b) | 48. (c) | 49. (b) |
| 50. (d) | 51. (d) | 52. (d) | 53. (b) | 54. (d) | 55. (d) | 56. (b) |
| 57. (d) | 58. (d) | 59. (d) | 60. (a) | 61. (c) | 62. (a) | 63. (d) |

Additional Short Questions

Short Answer Questions prepared in the light of new Examination Techniques
 (Knowledge, Understanding, Application, Analytical & Conceptual)

1. What do you know about the process cellular respiration?

Ans. Cellular respiration: Cellular respiration is the process in which cells oxidize food (glucose) and get energy.

- For this purpose, organisms need to carry oxygen to their cells and to remove carbon dioxide from cells.

2. What is breathing

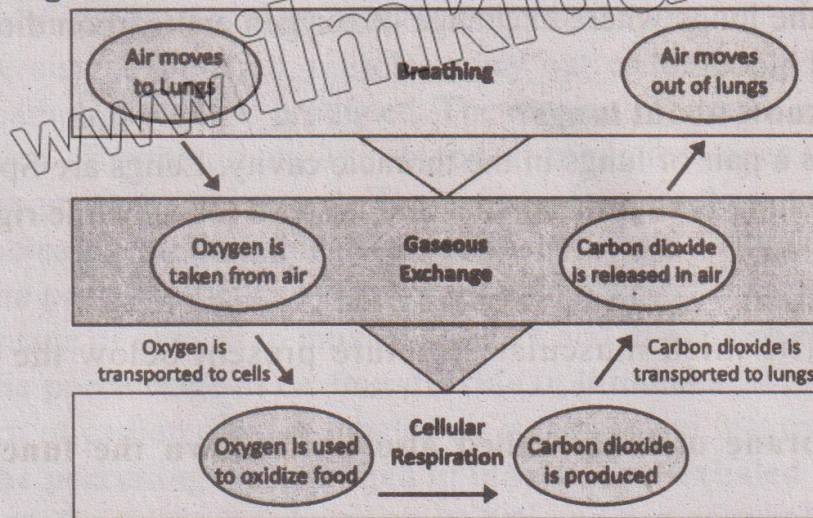
Ans. Breathing: Breathing is a mechanical process in which animals move air into and out of their body.

3. What is meant by gaseous exchange?

Ans. Gaseous exchange is the process in which oxygen present in the inhaled air (in lungs) moves into blood and carbon dioxide from the blood moves into the air to be

exhaled.

4. Draw a sketch to show the relationship between respiration, gaseous exchange and breathing.



2.1

Human Respiratory System

5. What are the major parts of human respiratory system?

Ans. The human respiratory system consists of two major parts i.e., air passageway and lungs.

6. What is the role of nasal cavity in the respiratory system?

Ans. The nasal cavity filters incoming air using fine hairs and mucus. It regulates the air's temperature nearly equal to that of the body.

7. Differentiate between glottis and epiglottis.

Ans. Glottis: At the floor of pharynx there is an opening called glottis. It opens in larynx.

Epiglottis: The glottis is guarded by flap called epiglottis.

8. What is voice box?

Ans. Larynx is also called the voice box. Two fibrous bands called vocal cords are attached to the inner walls of larynx. The vibrations of vocal cords produce sounds.

9. Write short note on trachea.

Ans. Trachea: Trachea also called windpipe is a 12cm (4.72 inches) long tube attached with larynx. The inner walls of trachea are lined with mucus and cilia. In the walls of trachea, C-shaped cartilages are present.

10. How structure of trachea is different from bronchi?

Ans. The trachea has C-shaped cartilages and remains a single tube while bronchi have irregular cartilage plates and are branching air passages inside the lungs.

11. Write down the functions of mucus and cilia in the inner walls of trachea and bronchi.

Ans. Mucus: Mucus traps fine dust particles and bacteria.

Cilia: Cilia moves the dust particles and bacteria upwards to the pharynx.

12. How C-shaped cartilages play its role in trachea?

Ans. The C-shaped cartilages present in the walls of trachea prevent trachea and bronchi

from collapsing even when there is no air in then.

13. Write a short note on alveoli.

Ans. Alveoli: Alveoli are tiny, thin-walled, sac like structures present at the ends of bronchioles in the lungs where exchange of oxygen and carbon dioxide takes place between air and blood.

14. What do you know about lungs?

Ans. Lungs: There is a pair of lungs in the thoracic cavity. Lungs are Spongy and elastic organs. The left lung is slightly smaller and has two lobes, while right lung is larger and has three lobes.

15. Define diaphragm.

Ans. Diaphragm: The thick muscular structure present below the lungs is called diaphragm.

16. What is membrane of lungs called also write down the function of pleural fluid?

Ans. Lungs are enclosed in a double membrane called pleural membrane.

Role of pleural fluid: Pleural fluid reduce friction between lungs and the chest wall.

17. How blood circulation takes place in lungs?

Ans. Blood circulation in lungs: Pulmonary artery carries deoxygenated blood from heart to lungs. Inside each lung, the pulmonary artery divides into smaller arterioles. The arterioles further divide and make capillaries around the alveoli. After surrounding the alveoli, the capillaries join to form venules. The venules join to form pulmonary vein which carries oxygenated blood back to heart.

2.2

The Mechanism of Breathing

18. How many phases of breathing are?

Ans. There are two phases of breathing:

(i) Inhalation

(ii) Exhalation

19. What does inhalation mean?

Ans. Inhalation means intake of air to the lungs.

20. Explain the mechanism of inhalation.

Ans. During inhalation:

- The inter-coastal muscles contract to expand the ribcage.
- At the same time, diaphragm also contracts and move down.
- The contractions increase the volume of the chest.
- Pressure inside the chest decreases.
- Air is moved into lungs.

21. What changes occurs in the thoracic cavity during exhalation?

Ans. During exhalation:

- The inter-coastal muscles relax to move ribcage inwards.
- At the same time diaphragm also relaxes and moves up.

- These movement decrease the volume of the chest.
- Pressure inside the chest increases.
- Air is forced out.

22. Why the breathing rate increases during exercise?

Ans. During exercise or hard job, muscles carry out cellular respiration at greater rate. So, more carbon dioxide is produced. The respiratory centre in brain detects greater concentration of carbon dioxide in blood. It sends messages to the muscles of ribs and diaphragm at greater speed. The speed of contraction and relaxation of these muscles increases. So, breathing rate increases up to 30–40 times per minute.

23. What is the percentage of oxygen in inhaled and exhaled air?

Ans. The percentage of oxygen in inhaled air is 21 and in exhaled air is 16.

24. What is the percentage of carbon dioxide in inhaled and exhaled air?

Ans. The amount of carbon dioxide inhaled air is 0.04% and that exhaled air is 4%.

25. What is the percentage of nitrogen in inhaled and exhaled air?

Ans. The amount of nitrogen in inhaled air is 79% and that of exhaled air is also 79%.

2.3

Respiratory Disorders

26. What is meant by bronchitis? Write down its types.

Ans. Bronchitis: Bronchitis means inflammation (swelling) in bronchi and bronchioles. In bronchitis, the inner space of bronchioles decreases.

Types of bronchitis:

- Acute bronchitis:** It lasts for two weeks.
- Chronic bronchitis:** It lasts for years.

27. What is chronic bronchitis?

Ans. In chronic bronchitis, mucus producing cells in the walls of bronchi increases in number. Thus there is thick mucus in bronchi. It obstructs the inhaled and exhaled air.

28. List the symptoms of bronchitis.

Ans. Symptoms of bronchitis: Coughing, wheezing, fever, chills and shortness of breath are the symptoms of bronchitis.

29. Write causes and treatment of bronchitis.

Ans. Causes: Causes include infections by viruses or bacteria, chemical irritants (smoke).

Treatment: Medications (cough suppressant) to ease breathing, antibiotics, (if it is due to bacterial infection) antiviral medicines (if it is due to viral infection) and avoiding irritants like smoke and pollution.

30. What happens in emphysema?

Ans. In emphysema, the inner walls of alveoli become weak and then rupture. Thus, one larger air space is created instead of many small ones. So, the space for gaseous exchange decreases and the patient cannot inhale properly.

31. Mention the symptoms and treatments of emphysema.

Ans. Symptoms: Symptoms of emphysema includes shortness of breath, chronic cough, (with or without mucus) wheezing and chest tightness.

Treatments: Treatments of emphysema are medicines to relieve cough and breathing problems. Emphysema cannot be cured completely.

32. Write a short note on pneumonia.

Ans. Pneumonia: Pneumonia is an inflammation in the lungs, due to infection in alveoli. In pneumonia, the alveoli are filled with pus.

Causes: Infections by bacteria, viruses and fungi.

Symptoms: The pneumonia patient suffers from high fever chills, shortness of breath and cough with sputum.

Treatment: Pneumonia is treated with antibiotics, antiviral and antifungal drugs and also with vaccines.

33. What is asthma? Write down its causes.

Ans. Asthma: Asthma is the inflammation of bronchi in which bronchi and bronchioles swell and constricted.

Causes: Causes include allergens, air pollutants, weather changes etc.

34. Write down symptoms of Asthma.

Ans. Symptoms of Asthma: Recurring attacks of shortness of breath, wheezing, coughing and chest tightness are the symptoms.

35. Define allergens.

Ans. Allergens: Allergens are allergy causing substances. It triggers the immune system such as pollen, dust, animal dander, mold etc.

36. Why passive smoking is dangerous?

Ans. The inhalation of smoke from another's smoking is called passive smoking. Passive smoking is dangerous because the smoke from the upper burning portion of cigarette is more dangerous than smoke exhaled by the smoker

37. What are the symptoms of lung cancer?

Ans. The most common symptoms of lung cancer are shortness of breath, coughing and weight loss.

38. What are the possible treatments for the lung cancer patients?

Ans. The patient of lung cancer is given one or more treatments including surgery, chemotherapy or radiation therapy.

39. State any two harmful effects of smoking on human health.

Ans. Effects of smoking: The most important risk of smoking is the abnormalities and cancer in lungs, kidneys, oral cavity, larynx, breast, bladder, esophagus, pancreas and stomach.

40. What is nicotine? Mention any two harmful effects of nicotine on the body.

Ans. Nicotine: Nicotine is a major component of cigarettes. It damages many tissues including brain. It also hardens the walls of arteries and results in heart problem.

41. What is tar? How does it affect the lungs and gaseous exchange?

Ans. Tar: Tar is present in cigarettes in the form of solid particles. When it is inhaled with smoke, it is deposited in lungs. It reduces the surface area for gaseous exchange.

42. What are carcinogens? Name any two carcinogens present in the cigarettes.

Ans. Carcinogens: Carcinogens are the substances that cause cancer in living organism.

Nicotine, tar and Benzene are the carcinogens present in cigarette.

43. Write down the harmful effects of formaldehyde and ammonia.

Ans. Formaldehyde: Formaldehyde present in cigarettes causes cancers and respiratory, skin and gastrointestinal problems.

Ammonia: Ammonia frees nicotine from tobacco turning it into a gas. It is poisonous for the body.

44. What are the harmful effects of smoking apart from lung cancer?

Ans. ● Smoking increases blood cholesterol levels.

● Smoking increases blood pressure.

● It weakens blood vessels.

● Smoking causes the staining of teeth.

Exercise Questions (Solved)



A. Select the correct answers for the following questions.

1. Breathing means;

(a) Breakdown of C-H bonds to produce energy

(b) Movements that take air in and out of body

(c) Getting oxygen from the air and removing carbon dioxide

(d) Transport of oxygen through blood to different parts of the body

2. Which path does air take immediately after passing through the larynx?

(a) Pharynx

(b) Bronchi

(c) Trachea

(d) Alveoli

3. Why are alveoli surrounded by capillaries?

(a) To absorb water

(b) To exchange gases

(c) To produce mucus

(d) To trap dust particles

4. Which feature of alveoli helps in rapid gas exchange?

(a) Thick walls

(b) Large diameter

(c) Moist surface

(d) Strong muscles

5. Which action increases lung volume during breathing?

(a) Relaxing the diaphragm

(b) Contracting intercostal muscles

(c) Closing the trachea

(d) Stiffening alveolar walls

6. Inhaled air contains 21% oxygen. What is its percentage in exhaled air?

(a) 0%

(b) 16%

(c) 21%

(d) 42%

7. Which factor controls the breathing rate?

(a) Carbon dioxide in blood

(b) Oxygen in blood

(c) Carbon dioxide in muscles

(d) Oxygen in muscles

8. The walls of alveoli are broken in:

(a) Pneumonia

(b) Bronchitis

(c) Emphysema

(d) Asthma

9. Smoking leads to lung cancer by:

(a) Increasing oxygen uptake

(b) Promoting uncontrolled cell division

(c) Slowing down healing

(d) Enlarging the trachea

10. Which chemical in cigarette smoke directly leads to addiction?

(a) Carbon monoxide

(b) Tar

(c) Nicotine

(d) Formaldehyde

Answers

- | | | | | |
|--------|--------|--------|--------|---------|
| 1. (b) | 2. (c) | 3. (b) | 4. (c) | 5. (b) |
| 6. (b) | 7. (a) | 8. (c) | 9. (b) | 10. (c) |

B. Write short answers.

1. Differentiate between gaseous exchange and breathing.

Ans. Gaseous Exchange: Gaseous exchange is the process in which oxygen present in the inhaled air (in lungs) moves into blood and carbon dioxide from the blood moves into the air to be exhaled.

- For gaseous exchange, animals do breathing.

Breathing: Breathing is a mechanical process in which animals move air into and out of their bodies.

- Breathing helps in gaseous exchange.

2. Differentiate between breathing and cellular respiration.

Ans. Breathing: Breathing is a mechanical process in which animals move air into and out of their body.

Cellular respiration: Cellular respiration is a chemical process where cells oxidize food (glucose) to release energy.

3. What is the function of cartilages present in the walls of trachea and bronchi?

Ans. The cartilages present in the walls of trachea and bronchi prevent trachea and bronchi from collapsing even when there is no air in them.

4. What is the average breathing rate in human at rest and during exercise?

Ans. Humans breathe 16–20 times per minute in normal conditions at rest. The breathing rate increases up to 30–40 times per minute during exercise.

5. How does the structure of alveoli maximize gas exchange?

Ans. Alveoli maximize the gas exchange through a large surface area provided by millions of tiny sacs and a dense network of capillaries.

6. List the symptoms, causes, and treatments of bronchitis.

Ans. Symptoms of bronchitis: Coughing, wheezing, fever, chills and shortness of breath are the symptoms of bronchitis.

Causes: Causes include infections by viruses or bacteria, chemical irritants (smoke).

Treatment: Medications to ease breathing, antibiotics, antiviral medicines and avoiding irritants like smoke and pollution.

7. Mention the symptoms and treatments of emphysema.

Ans. Symptoms: Symptoms of emphysema includes shortness of breath, chronic cough, wheezing and chest tightness.

Treatments: Treatments of emphysema are medicines to relieve cough and breathing problems. Emphysema cannot be cured completely.

8. What are carcinogens? Name any two carcinogens present in cigarettes.

Ans. Carcinogens: Carcinogens are the substances that cause cancer in living organism. Nicotine, tar and Benzene are the carcinogens present in cigarette.

9. Complete the following table:

Ans.	Feature	Inspired Air	Expired Air
	Oxygen	21%	16%
	Carbon dioxide	0.04%	4%
	Nitrogen	79%	79%

C. Write answers in detail.

1. Explain the process of inhalation and exhalation step by step.

Ans. For answer See Question. No. 6

2. Write a short note on the major parts of the human air passageway.

Ans. For answer See Question. No. 2

3. Describe the functions and locations of the bronchus, trachea, and alveoli.

Ans. For answer See Question. No. 3

4. What are the possible causes of lung cancer? Explain the harmful effects of smoking apart from lung cancer.

Ans. For answer See Question. No.13 (causes) Question No.14(other effects of smoking)

D. Inquisitive Questions

1. What can happen to breathing if diaphragm stops working properly?

Ans. The main function of diaphragm is inhalation. If it does not work properly the chest cavity will not be able to expand or contract. In this way less oxygen reaches to the blood.

2. Why is it dangerous when smoke particles settle inside lungs?

Ans. Smoke particles in the lungs damage alveoli and airway, reduce oxygen absorption and can cause serious diseases like Emphysema.

3. Why does the trachea have C-shaped cartilage rings while bronchioles do not have them?

Ans. **Trachea:** Trachea has C-shaped cartilage rings which help it to open at all times preventing it from collapsing when there is no air in them.

Bronchioles: Bronchioles do not have C-shaped cartilage rings because they are very much smaller, soft and flexible. Their walls can be kept open by smooth muscles so rigid cartilage is not needed.

4. During asthma attacks, patients feel harder to exhale than to inhale. Why is it so?

Ans. Asthma is the inflammation of bronchi in which bronchi and bronchioles swell and are constricted.

During inhalation the chest expands.

Pulling the air in so inhalation is easier, while exhalation is harder because the chest cavity relaxes and the pressure increases, which causes the already narrowed and inflamed airways to collapse or compress further making it very difficult for air to leave the lungs.