
	INDIAN SCHOOL AL WADI AL KABIR	
Class: XI	Department: SCIENCE 2023-2024 SUBJECT: BIOLOGY	Date of submission: 23.11.2023
Worksheet 10 with answers	CHAPTER: Breathing and Exchange of Gases	Note: A4 FILE FORMAT
NAME OF THE STUDENT	CLASS & SEC:	ROLL NO.

MULTIPLE CHOICE QUESTIONS (1M each)

Q1. Respiration in mature mammalian erythrocytes are _____

1. Linear
2. Absent
3. Anaerobic
4. Aerobic

Q2. Human skin cannot function as a respiratory organ because

1. It is not permeable to O₂ and CO₂
2. It is rather thick
3. It is dry
4. All of the above

Q3. Where does the exchange of gases occur in birds?

1. Air sacs only
2. Air sacs and Lungs
3. Lungs only
4. First in air sacs and then in the lungs

Q4. The ring of cartilage that surrounds the trachea is called _____

1. Treillage
2. Voicebox
3. Arytenoid cartilage

4. Cricoid cartilage

Q5. The number of alveoli in human lungs is estimated to be around _____

1. 150 million
2. 500 million
3. 800 million
4. 1 billion

Q6. Earthworms breathe through their _____

1. Pores on its anterior end
2. Head
3. Skin
4. Lungs

Q7. _____ prevents the collapse of the trachea

1. Jugular foramen
2. Cartilaginous rings
3. Diaphragm
4. None of the above

Q8. Glottis opens on the floor of

1. Pharyngeal cavity
2. Diaphragm
3. Trachea
4. None of the above

Q9. Spiracles in cockroaches are analogous to _____ in humans

1. Trachea
2. Nostrils
3. Lungs
4. None of the above

Q10. Pick out the statement that is wrong with respect to insects

1. Abdominal muscles do not take part in respiration
2. When abdominal muscles relax, the air is drawn in through spiracles and tracheoles
3. Contracting abdominal muscles drive the air out through the spiracles

4. Both (2) and (3)

SHORT ANSWER TYPE QUESTIONS (2M)

Q.11. Define:

- a) Tidal volume
- b) Residual volume
- c) Asthma

Q12. Write the name and important function of the fluid-filled double membranous layer surrounding the lungs.

Q13. Why does smoking cigarette cause emphysema?

Q14. What Is Breathing?

LONG ANSWER TYPE QUESTIONS (3M)

Q.15. What is Respiratory Quotient?

Q.16. Name the organs of respiration in cockroach, earthworm and birds?

Q17. Why does one have trouble at a high altitude?

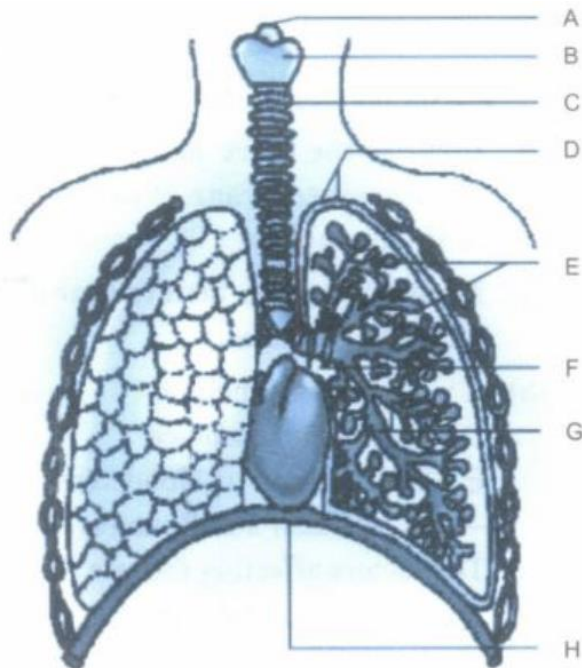
Q18. What is a specialized respiratory surface and what are its advantages?

VERY LONG ANSWER TYPE QUESTIONS (5M)

Q.1. Write a note on the mechanism of breathing

Q.2. Describe the role of the neural system in controlling respiration.

CASE STUDY #1



A diagrammatic view of human respiratory system (with a sectional view of the left lung) is shown above. Answer the following questions

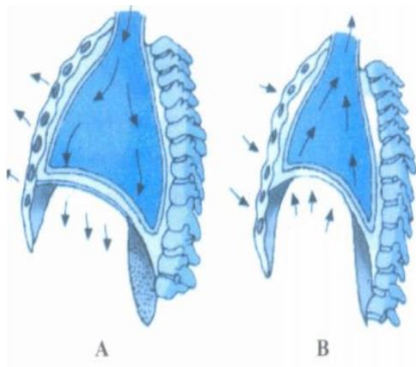
- Identify any four parts belonging to the conducting part of the respiratory system.
- Mention any two functions of the conducting parts of the system other than the transport of air to alveoli.

Q2) The lungs are situated in the thoracic chamber, which is anatomically an air-tight chamber. Answer the following questions regarding this.

- Mention the boundaries of the thoracic chamber that make it an air-tight chamber.
- What is its significance?
- Why is it essential for breathing?

Q3) The two stages in the breathing process are shown below. Observe the diagram and answer the question that follow:

- Identify the two stages (A and B) of breathing.
- Mention the condition and the position of diaphragm in A and B, respectively.
- Compare the intra-pulmonary air pressure in the stages A and B.



CASE STUDY #2

Haemoglobin is a red coloured iron containing pigment present in the RBCs. O₂ can bind with haemoglobin in a reversible manner to form oxyhaemoglobin. Each haemoglobin molecule can carry a maximum of four molecules of O₂. Binding of oxygen with haemoglobin is primarily related to partial pressure of O₂. Partial pressure of CO₂, hydrogen ion concentration and temperature are the other factors which can interfere with this binding. A sigmoid curve is obtained when percentage saturation of haemoglobin with O₂ is plotted against the pO₂. This curve is called the Oxygen dissociation curve and is highly useful in studying the effect of factors like pCO₂, H⁺ concentration, etc., on binding of O₂ with haemoglobin. In the alveoli, where there is high pO₂, low pCO₂, lesser H⁺ concentration and lower temperature, the factors are all favourable for the formation of oxyhaemoglobin, whereas in the tissues, where low pO₂, high pCO₂, high H⁺ concentration and higher temperature exist, the conditions are favourable for dissociation of oxygen from the oxyhaemoglobin. This clearly indicates that O₂ gets bound to haemoglobin in the lung surface and gets dissociated at the tissues. Every 100 ml of oxygenated blood can deliver around 5 ml of O₂ to the tissues under normal physiological conditions.

CO₂ is carried by haemoglobin as carbamino-haemoglobin (about 20-25 per cent). This binding is related to the partial pressure of CO₂. pO₂ is a major factor which could affect this binding. When CO₂ is high and pO₂ is low as in the tissues, more binding of carbon dioxide occurs whereas, when the pCO₂ is low and pO₂ is high as in the alveoli, dissociation of CO₂ from carbamino-haemoglobin takes place, i.e., CO₂ which is bound to haemoglobin from the tissues is delivered at the alveoli. RBCs contain a very high concentration of the enzyme, carbonic anhydrase and minute quantities of the same is present in the plasma too.

1.) _____ of O₂ and CO₂ is carried in a dissolved state through the blood plasma.

- a) 3% and 8%
- b) 70% and 20%
- 3% and 9%
- 3% and 7%

2) Identify the correct statement

Statement 1 – 7 per cent of O₂ is carried in a dissolved state through the plasma

Statement 2 – 3 per cent of CO₂ is carried in a dissolved state through plasma.

Statement 3 – 70 per cent of CO₂ is carried as bicarbonate.

Statement 4 – 97 per cent of CO₂ is transported by RBCs.

- a) Both 1 & 2 are correct
- b) Both 3 & 4 are correct
- c) Only 1 is correct
- d) None of the above

- 3.) Name the factors which play key role in binding of oxygen and haemoglobin.**
- 4.) How Oxygen dissociation curve are obtained.**
- 5.) How much oxygen can deliver to tissue per 100 ml of oxygenated blood in normal conditions?**

Answer Key

- 1) 3
- 2) 4
- 3) 3
- 4) 4
- 5) 2
- 6) 3
- 7) 2
- 8) 1
- 9) 2
- 10) 1

A.11. a) Tidal volume (TV) is the air volume expired or inspired during respiration. In a healthy individual, it is about 500ml. Hence per minute, it is about 6000-8000ml of air.

b) Residual volume (RV) is the air volume left in the lungs following a forcible expiration which is about 1100-1200ml.

c) It is a disease that is caused because of an allergic reaction to foreign particles. Inflammation of the bronchi causes breathing difficulty and hence coughing and wheezing.

A.12. It is pleura and the fluid is pleural fluid. The outer and inner pleural membrane collectively reduce friction or resistance on the lungs.

A.13. It is a chronic disease of the respiratory system where inflation of the alveolar occurs. Over a period, cigarette smoking or even inhalation of smoke causes the damage of septa between the alveoli and of its elastic tissue is substituted by the connective tissue in the lungs. The respiratory surface decreases which cause emphysema.

A.14. Breathing is defined as the biological process in which air moves in and out of the lungs. This process is carried out by the various organs of the human respiratory system.

A.15. The actual ratio of the volume of carbon dioxide eliminated to the volume of oxygen consumed during the act of cellular respiration is called the respiratory quotient. It is also referred as the respiratory ratio and is denoted by RQ.

The formulae of Respiratory Quotient is given by:

RQ = volume of Carbon dioxide eliminated / volume of Oxygen consumed

A.16.

1. Cockroaches respire through small openings on the sides of its body called spiracles.
2. Earthworm respire through the skin.
3. Birds respire through the lungs.

A17. Pressure of air falls, person cannot get enough oxygen for diffusion in blood. Insufficient oxygen leads to difficulty in breathing. Person feels breathlessness, headache, nausea and dizzy.

A18. It is thin, moist, and highly vascular. Diffusion can take place from the respiratory surface between the body and outside the environment.

A.19. a) Inspiration – It is induced by the diaphragm contraction that raises the volume of the thoracic chamber in the anteroposterior axis. The inter-costal muscles contracts causing external protrusion of the sternum and ribs resulting in an increment in the volume of the thoracic chamber in the dorsoventral axis. This increase in the thoracic volume results in a similar increase in pulmonary volume causing reduced intrapulmonary pressure to lesser than the atmospheric pressure which results in inspiration. **b)** Expiration – The inter-costal muscles reverse the sternum and diaphragm to their original positions with the diaphragm relaxing, which decreases the thoracic volume and hence the pulmonary volume. Expulsion of air occurs as the intra-pulmonary pressure increases to a level somewhat above the atmospheric pressure causing expiration.

A.20. The neural system maintains and moderates the respiratory rhythm as per the demands of the body tissues. The respiratory rhythm center present in the brain is responsible for regulation. The pneumotaxic centre, another region in the pons of the brain, moderates the functions of the respiratory rhythm centre. The neural signals from this centre can reduce the duration of inspiration hence altering the rate of respiration. A chemosensitive area present adjacent to the rhythm centre is very sensitive to hydrogen ions and CO₂ which activate this centre by an increase of these substances. These send down a signal to the rhythm centre to cause essential adjustments in the process which can cause the elimination of these substances. Changes in CO₂ and hydrogen ions are recognized by receptors linked with aortic arch and carotid artery, thereby sending signals for corrective actions to the rhythm centre.

Answer key For CASE STUDY #2

1) d

2) c

3.) Following factors play key role in binding of oxygen and haemoglobin.

- Partial pressure of CO₂
- Hydrogen ion concentration
- Temperature

4.) Oxygen dissociation curve is obtained when percentage saturation of haemoglobin with O_2 is plotted against the pO_2 . This curve also known as sigmoid curve. It is highly useful in studying the effect of factors like pCO_2 , H^+ concentration.

5.) Every 100 ml of oxygenated blood can deliver around 5 ml of O_2 to the tissues under normal physiological conditions.

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