

Chapter 1: Respiration

Lower Secondary Science Practice Worksheet

Name: _____

Date: _____

Instructions: Read each section carefully. This worksheet contains 50 questions divided into 7 distinct parts to test your fundamental understanding of the respiratory and circulatory systems.

Part 1: Multiple Choice Questions

Circle the correct answer for each question.

1. What is the scientific term for the voice box?

- A. Trachea
- B. Larynx
- C. Bronchus
- D. Alveoli

Answer: B (Larynx)

2. Where exactly does gas exchange occur in the human body?

- A. In the trachea
- B. In the diaphragm
- C. In the air sacs (alveoli)
- D. In the heart

Answer: C (In the air sacs (alveoli))

3. What is the main function of the diaphragm and intercostal muscles?

- A. To pump blood around the body
- B. To control the physical movement of breathing
- C. To carry out cellular respiration
- D. To produce red blood cells

Answer: B (To control the physical movement of breathing)

4. Which process explains how oxygen moves from the lungs into the blood?

- A. Respiration
- B. Digestion
- C. Ventilation
- D. Diffusion

Answer: D (Diffusion)

5. Where does aerobic respiration take place inside a cell?
- A. Nucleus
 - B. Cytoplasm
 - C. Mitochondria
 - D. Cell membrane

Answer: C (Mitochondria)

6. What type of chemical reaction is aerobic respiration?
- A. Endothermic
 - B. Exothermic
 - C. Photosynthetic
 - D. Magnetic

Answer: B (Exothermic)

7. Which component of blood is primarily responsible for transporting dissolved carbon dioxide?
- A. Red blood cells
 - B. White blood cells
 - C. Plasma
 - D. Haemoglobin

Answer: C (Plasma)

8. What special feature allows red blood cells to carry oxygen efficiently?
- A. They have a large nucleus.
 - B. They contain a red pigment called haemoglobin.
 - C. They are made of pale yellow liquid.
 - D. They produce antibodies.

Answer: B (They contain a red pigment called haemoglobin)

9. Which of the following is NOT a method used by white blood cells to defend the body?
- A. Producing antibodies
 - B. Digesting pathogens in their cytoplasm
 - C. Transporting nutrients to pathogens
 - D. Protecting against disease-causing microbes

Answer: C (Transporting nutrients to pathogens)

10. What happens to the temperature of a sugar solution when living yeast is added to it?
- A. It drops because yeast absorbs heat.

- B. It stays the exact same.
- C. It rises because respiration releases heat energy.
- D. It boils instantly.

Answer: C (It rises because respiration releases heat energy)

Part 2: Fill in the Blanks

Complete the following sentences using the correct scientific terms.

11. Air travels down the main tube called the _____, also known as the wind-pipe.

Answer: Trachea

12. The main tube splits into two smaller tubes called the _____, one for each lung.

Answer: Bronchi

13. Mammals have millions of air sacs, creating a massive total _____ area for rapid gas exchange.

Answer: Surface

14. During gas exchange, carbon dioxide diffuses from the _____ into the air in the lungs.

Answer: Blood

15. Breathing is often referred to scientifically as _____.

Answer: Ventilation

16. Unlike breathing, respiration is a _____ reaction that happens inside your cells.

Answer: Chemical

17. The word equation for aerobic respiration is: Glucose + _____ → Carbon Dioxide + _____.

Answer: Oxygen ; Water

18. Human blood is a transport system ferrying gases and _____ to where they are needed.

Answer: Nutrients

19. Red blood cells do not contain a _____, making more room for oxygen transport.

Answer: Nucleus

20. Disease-causing microbes are scientifically known as _____.

Answer: Pathogens

Part 3: True or False

Indicate whether each statement is True (T) or False (F). Write T or F in the brackets.

[] 21. Breathing and respiration mean the exact same thing in science.

Answer: False (They are distinct processes)

[] 22. Your lungs are protected by your ribcage.

Answer: True

[] 23. Oxygen diffuses from the blood into the air in the lungs to be exhaled.

Answer: False (Oxygen diffuses into blood, CO₂ diffuses into lungs)

[] 24. Aerobic respiration happens in animal cells, but not in plant cells.

Answer: False (Occurs in both plant and animal cells)

[] 25. Blowing into a tube connected to a water-filled bottle can measure the volume of a single breath.

Answer: True

[] 26. Plasma is a pale yellow liquid.

Answer: True

[] 27. White blood cells defend the body by producing a red pigment called haemoglobin.

Answer: False (WBCs produce antibodies; RBCs have haemoglobin)

[] 28. A person moving to a high altitude will produce fewer red blood cells due to thinner air.

Answer: False (The body produces MORE red blood cells)

[] 29. The diaphragm is a sheet of muscle located directly below the lungs.

Answer: True

[] 30. Aerobic respiration provides a controlled release of energy that bodies need to survive.

Answer: True

Part 4: Sequencing the Pathway of Air

Order the following anatomical structures from 1 to 5 to show the correct pathway of air as it enters the body and travels to where gas exchange occurs. Write the numbers 1 through 5 in the blanks provided.

_____ 31. Bronchioles

Answer: 4

_____ 32. Trachea (Windpipe)

Answer: 2

_____ 33. Air Sacs (Alveoli)

Answer: 5

_____ 34. Larynx (Voice box)

Answer: 1

_____ 35. Bronchus

Answer: 3

Part 5: Short Answer Questions

Write concise, accurate answers to the following questions.

36. Briefly define the process of “gas exchange” as it occurs in the lungs.

Answer: The process of diffusion where oxygen moves from the air in the lungs into the blood, and carbon dioxide moves from the blood into the air in the lungs.

37. What is the specific purpose of the mitochondria in a cell?

Answer: Mitochondria are the specific sites inside cells where aerobic respiration occurs to release energy.

38. List the three main components of human blood.

Answer: Plasma, Red Blood Cells, and White Blood Cells.

39. Explain the two different ways that white blood cells destroy pathogens.

Answer: 1) Producing antibodies that attach to and destroy pathogens. 2) Taking pathogens directly into their cytoplasm and digesting them.

40. Describe the structural relationship between the trachea, bronchi, and bronchioles.

Answer: The trachea is the main windpipe, which splits into two main branches called bronchi. The bronchi then divide further into many smaller microscopic tubes called bronchioles.

Part 6: Analogy and Real-World Interpretation

Apply your foundational understanding to these analogies and real-world scenarios.

41. In the “upside-down tree” analogy of the respiratory system, what do the “leaves” represent, and why is this a fitting comparison based on their function?

Answer: The leaves represent the alveoli (air sacs). Just as leaves perform the main chemical work of the tree (photosynthesis), alveoli are where the primary functional work of the lungs (gas exchange) takes place.

42. A student performs an experiment with yeast and a sugar solution. They notice the thermometer’s temperature rises over time. From a first-principles perspective, what specific biological process is causing this, and why?

Answer: Aerobic respiration. The yeast respire to break down sugar for energy. Because this is an exothermic reaction, it releases heat into the surroundings, causing the temperature to rise.

43. An athlete trains in the mountains where the air is very thin (less oxygen). Explain how their blood adapts to this environment and why this adaptation is strictly necessary for survival.

Answer: The body produces more red blood cells. This increases the blood’s total oxygen-carrying capacity, compensating for the lower oxygen concentration in the thinner air and ensuring cells still get the required oxygen.

44. If the human cardiovascular system were compared to a city’s delivery network, what specific cells would act as the “delivery trucks” for oxygen, and what is the “cargo” they carry inside them?

Answer: The delivery trucks are the red blood cells. The specific cargo they carry is oxygen, bound to the red pigment haemoglobin.

45. Why is the massive “surface area” of the alveoli comparable to spreading out a highly crumpled piece of paper? How does this physical layout improve efficiency?

Answer: A crumpled piece of paper packs a large flat surface area into a small volume. Similarly, millions of tiny spherical alveoli pack a massive surface area inside the limited volume of the chest cavity, allowing diffusion to happen much more efficiently and rapidly.

Part 7: Critical Thinking and Application

Analyze the underlying physical and biological principles to answer the following questions comprehensively.

46. Contrast the terms “breathing” and “respiration.” Why is it scientifically inaccurate for someone to say they are “respiring heavily” when they are panting after a long sprint?

Answer: Breathing is the physical, mechanical ventilation of the lungs. Respiration is a microscopic chemical reaction inside cells. Panting is a mechanical action, so it is incorrect to call it “respiring.”

47. The human body contains millions of alveoli. Predict the physical consequences to a person’s athletic abilities if a respiratory disease caused half of their alveoli to merge into larger, single sacs, thereby drastically reducing the total surface area.

Answer: Their physical abilities would drop significantly. Less surface area means the rate of gas exchange (diffusion) drops. Cells would receive oxygen too slowly, severely limiting the energy produced via respiration for muscle movement.

48. Imagine a theoretical single cell was born without any mitochondria. Based on the word equation for aerobic respiration, deduce what specific chemical reaction this cell would be unable to perform, and predict the ultimate fate of that cell.

Answer: The cell would be unable to perform aerobic respiration (combining glucose and oxygen to release energy). Without a mechanism to unlock energy, the cell would be unable to survive, grow, or function, and would quickly die.

49. Compare the biological design of a red blood cell to a white blood cell. How does the evolutionary absence of a nucleus in a red blood cell directly relate to its mechanical efficiency in the transport system?

Answer: Red blood cells lack a nucleus, trading genetic capability for maximum internal volume packed entirely with haemoglobin, optimizing oxygen transport. White blood cells retain a nucleus to synthesize complex proteins (antibodies).

50. During intense exercise, a person’s breathing rate and heart rate both increase simultaneously. Using your knowledge of respiration and blood, explain why these two systems must work together in this way to sustain physical exertion.

Answer: Exercise requires muscles to release more energy via respiration, demanding more O₂ and producing more CO₂. The breathing rate increases to bring more O₂ into the lungs and expel CO₂. Simultaneously, the heart rate increases to pump blood faster, ensuring rapid delivery of O₂ to cells and quick removal of waste.