General Biology Year 11

Unit 2 – Solving problems to survive

Task 7: Practical – Gas exchange in animals

MARKING KEY

**PART A:** **The fish**

1. The fish you will examine is described as a ‘bony’ fish. Examine the external structure of the head of the fish. Identify the structures shown in the diagram below. Locate the **operculum**, lift it and look at the gills.

What do you think is the function of the operculum? (1 mark)

It protects the gills.

1. Cut out a small piece of gill and float it in a petri dish of water.

Describe what happened when you floated the piece of gill in the water? (1 mark)

The gill has spread out. The water has separated the filaments.

What does this tell you about the structure of the gill? (1 mark)

It is made up of small filaments to increase the SA:VoL

1. With the **operculum** open, insert a blunt probe into its opening and determine where the cavity ends.

What **colour** were the gills of your fish? Suggest a **reason** for this colour. (1 mark)

Red. Lots of thin blood vessels indicating oxygenated blood present.

1. Refer to the fish video on the board. Observe a goldfish in a **fish tank**.

Describe the movement of the mouth and the operculum. (1 mark)

The movements of the mouth and operculum produce a stream of water, in through the mouth and over the gills and out of the operculum.

When the fish closes it mouth, where does the **water** go? (1 mark)

Over the gills and out the opercalum.

1. Remove a single gill. Examine the gill under a hand lens or binocular microscope to see the structure in more detail.

Draw a **labelled diagram** of **one gill** of a fish in the box below. (3 marks)

Correct diagram, no shading, sharp lines, labels (>=2)

(1 mark each)

1. Why do you think fish have **numerous flattened epithelial surfaces** (gill filaments)?

(1 mark)

To increase SA:Vol.

1. Describe how gills absorb oxygen and disperse carbon dioxide. (3 marks)

The water enters the mouth and passes through the feathery filaments of the fish's gills, which are rich in blood (1). These gill filaments absorb oxygen from the water and move it into the bloodstream (1). At the same time, waste carbon dioxide in the blood passes out through the gills into the water (1).

**PART B:** **The rat**

**Questions**

1. Often the lungs of mammals look like two balloons. Does this **description fit the shape** and structure of the rat’s lungs? Describe the structure of the lungs. (2 marks)

The lungs are a pair of spongy, air-filled organs located on either side of the chest (thorax) (1). The trachea (windpipe) conducts inhaled air into the lungs through its tubular branches, called bronchi (1).

1. The lung tissue is made up of tiny air-filled sacs, the alveoli with walls which are one cell thick. Oxygen inhaled by the rat passes across these walls into blood capillaries.

Draw a **labelled diagram** of the lungs of a rat in the box below. (4 marks)

Labels – 4 labels 1 mark each

1. What do you think is the **function** of the trachea? (1 mark)

To take air to the alveoli (air sacs)

1. Suggest a **function** for the **cartilage** in the **trachea**. (1 mark)

The **tracheal** cartilages help support the **trachea** while still allowing it to move and flex

during breathing (strong and flexible).

1. What muscles are involved with breathing for the rat? (1 mark)

Intercostal muscles and diaphragm (1/2 mark each)

1. How is air moved into lungs of the rat? (3 marks)

Diaphragm and intercostal contract (1 mark), increasing volume lower pressure (1 mark), difference in pressure forces air into lungs (1 mark).

1. Complete the table below. (5 marks)

1 mark each

|  |  |  |
| --- | --- | --- |
|  | **Fish** | **Rat** |
| **Air enters the body via . . .** | the mouth | the mouth |
| **Exchange of oxygen occurs across the . . .** | gill plates | lungs |
| **Is the respiratory surface moist?** | yes, surrounded by water | yes |
| **The surface of the respiratory is increased by . . .** | the immense respiratory surface created by the gill filaments provides the whole animal with an efficient gas exchange. The surrounding **water** keeps the gills wet. | Large **surface area** - many alveoli are present in the lungs with a shape that further **increases surface area**. ... |
| **Increased oxygen flow across the respiratory surface is assisted by . . .** | Water passes through the feathery filaments of the fish's gills | breathing |