

1.6 Sensation

Name: _____ Class: _____ Date: _____

Total: 10 marks

KEY WORDS retina 视网膜 • cones 视锥细胞 • absolute threshold 绝对阈限 • difference threshold 差别阈限
• transduction 转导

Objective

Build the skills to answer exam questions on **sensation** 感觉 and **transduction** 转导.

You must be able to:

- define **transduction** and give an example in one sense
- distinguish **absolute threshold** 绝对阈限 from **difference threshold** 差别阈限
- state what **sensory adaptation** 感觉适应 is and why it is useful
- describe how the eye and ear convert energy into neural signals

1 Worked examples

Study these first. Each one shows the method for a task used later.

■ Transduction

Sense organs convert physical energy into neural signals. Light becomes a signal in the **retina**; sound becomes one in the **cochlea**; pressure becomes one in receptors in the skin.

■ Two thresholds

Absolute threshold is the smallest stimulus detectable 50% of the time. **Difference threshold** (just-noticeable difference) is the smallest change detectable 50% of the time, and it grows in proportion to the starting intensity.

■ Sensory adaptation

Constant, unchanging stimulation produces a declining response — you stop noticing a smell or the weight of clothing. This frees attention for **change**, which is what usually matters.

■ Eye and ear

In the eye, light passes the lens and strikes **rods** (dim light, no colour) and **cones** (colour, detail) in the retina. In the ear, sound vibrates the eardrum, is amplified by three small bones, and moves fluid in the cochlea, bending hair cells.

2 Practice

2.1 Define transduction and give one example. [2]

2.2 State the difference between an absolute threshold and a difference threshold. [2]

2.3 A person stops noticing the hum of a fan after a few minutes.

(a) Name the process responsible. [1]

(b) State one advantage of this process. [1]

3 Exam-style questions

3.1 Rods differ from cones mainly in that rods [1]

- **A** detect colour and fine detail
- **B** work better in dim light without colour
- **C** are located in the cochlea
- **D** transmit sound

3.2 Adding one candle to a room with two candles is noticeable; adding one to a room with fifty is not. This illustrates [1]

- **A** absolute threshold
- **B** a difference threshold that grows with intensity
- **C** sensory adaptation
- **D** transduction

3.3 A hearing test finds the quietest tone a person can detect half the time.

(a) Name the measure being taken. [1]

(b) State one reason results vary between people.

[1]

Solutions

2.1 the conversion of physical energy into neural signals; e.g. light converted to a signal in the retina, or sound in the cochlea.

2.2 absolute threshold: the smallest stimulus detected 50% of the time; difference threshold: the smallest detectable change in a stimulus, which grows with starting intensity.

2.3 (a) sensory adaptation. (b) it frees attention for changes in the environment, which are usually more informative.

3.1 B. rods support vision in dim light but do not code colour.

3.2 B. the just-noticeable difference is proportional to the original intensity.

3.3 (a) the absolute threshold for that tone. (b) any one of: age-related hearing loss; prior noise exposure; attention or motivation during the test.