Exercise walk-through

Sensation ▪ 1.6

eXercise

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

Method — 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.

Method — 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.

Method — 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.

Method — 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.

Practice 2.1 ▪ 2 marks

Define transduction and give one example.

Solution 2.1

Worked steps

the conversion of physical energy into neural signals B1; e.g. light converted to a signal in the retina, or sound in the cochlea B1.

Practice 2.2 ▪ 2 marks

State the difference between an absolute threshold and a difference threshold.

Solution 2.2

Method: Two thresholds

Worked steps

absolute threshold: the smallest stimulus detected 50% of the time B1; difference threshold: the smallest detectable change in a stimulus, which grows with starting intensity B1.

Practice 2.3 ▪ 1 mark

A person stops noticing the hum of a fan after a few minutes.
(a) Name the process responsible.
(b) State one advantage of this process.

Solution 2.3

Worked steps

(a) sensory adaptation B1. (b) it frees attention for changes in the environment, which are usually more informative B1.

Exam-style 3.1 ▪ 1 mark

Rods differ from cones mainly in that rods

A detect colour and fine detail

B work better in dim light without colour

C are located in the cochlea

D transmit sound

Solution 3.1

Method: Eye and ear

A detect colour and fine detail

B work better in dim light without colour ✓

C are located in the cochlea

D transmit sound

Worked steps

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

Exam-style 3.2 ▪ 1 mark

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

A absolute threshold

B a difference threshold that grows with intensity

C sensory adaptation

D transduction

Solution 3.2

A absolute threshold

B a difference threshold that grows with intensity ✓

C sensory adaptation

D transduction

Worked steps

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

Exam-style 3.3 ▪ 1 mark

A hearing test finds the quietest tone a person can detect half the time.
(a) Name the measure being taken.
(b) State one reason results vary between people.

Solution 3.3

Worked steps

(a) the absolute threshold for that tone B1. (b) any one of: age-related hearing loss; prior noise exposure; attention or motivation during the test B1.