

12.1 Sensation, perception and psychophysics: evidence and transfer

Name: _____ Class: _____ Date: _____

Total: 8 marks

KEY WORDS difference threshold • transduction

Objective

Distinguish thresholds, Weber's law and signal-detection measures; Trace transduction from physical stimulus to neural signal; Apply perceptual organisation and categorical perception principles. Original practice and authored marking guidance.

1 Key knowledge and worked examples

difference threshold : The minimum detectable change in a stimulus, a constant fraction of the baseline by Weber's law. **transduction** : Conversion of physical stimulus energy into neural signals by receptors.

A threshold is defined by a detection criterion under specified conditions, often 50% detection for an absolute threshold, rather than a sharp physical boundary between always seen and never seen. Weber's approximation predicts changes proportional to a baseline within its useful range. Transduction changes energy into neural signalling; perception groups and interprets that input. A change in reporting incentives primarily concerns decision criterion, while changes in physical contrast may affect sensitivity.

Signal detection: four outcomes separate sensitivity from bias

	Signal present	Signal absent
Respond yes	Hit	False alarm
Respond no	Miss	Correct rejection

Worked case. With a fictional Weber fraction $k=.03$, estimate the just noticeable difference for 100 g and 300 g baselines.

$\Delta I/I=k$, so $\Delta I=kI$. $\Delta I=.03 \times 100 \text{ g}=3 \text{ g}$; $\Delta I=.03 \times 300 \text{ g}=9 \text{ g}$. The fraction is dimensionless and the result has the baseline's unit. A constant 3 g prediction at both baselines would ignore the proportional model. The approximation does not establish identical thresholds for all observers or intensities.

2 Practice

2.1 With Weber fraction $k=.02$, the just noticeable difference for a 250 g baseline is: [1]

A. 0.02 g B. 2 g C. 5 g D. 25 g E. 50 g

2.2 After a payoff change, an observer says yes more often while the stimulus is unchanged. In signal detection theory, what moved? [1]

A. sensitivity d' B. the response criterion C. the absolute threshold D. the Weber fraction E. receptor transduction

2.3 Revisit the worked case. State one conclusion its evidence supports and one stronger conclusion it does not support. Explain the difference. [2]

3 Exam-style questions

3.1 A listener says yes on more signal and more noise trials after a warning. Explain why sensory adaptation is not the only or best initial explanation. Give the interpretation, supporting reasoning, a relevant alternative or limitation, and an appropriate check. [4]

Solutions

2.1 Answer: C. $\Delta I = k \times I = .02 \times 250 = 5$ g. The other options do not satisfy the stated defining conditions.

2.2 Answer: B. Payoffs move the criterion (bias); sensitivity depends on the signal and noise distributions. Compare the exact process, design or evidence, rather than an associated keyword.

2.3 Use the worked case evidence to support a bounded claim and explain why a causal, universal or stronger claim needs additional evidence. The claim must fit the specific design and observed process.

3.1 A warning can shift the response criterion toward reporting a signal. Compare both hit and false-alarm rates, not hits alone. Sensory adaptation concerns changing sensory response during sustained stimulation; the warning manipulation does not by itself establish that process. A sensitivity analysis could test whether signal/noise separation also changed. Award B1 each (authored) for the interpretation, its reasoning, a relevant limitation/alternative and an appropriate check, up to four points. Accept a different justified answer satisfying these demands.