Practice exam Cognitive Psychology and its Applications

1) What is the inverse projection problem?

A: The fact that visual input projects onto the contralateral hemisphere.
B: The fact that from a retinal image alone there is no certainty about the visual environment.
C: The fact that bottom-up visual processing is biased by top-down expectations.
D: The fact that the visual cortex has to support both visual perception and memory recall.

2) Rank the fovea, parafovea and perifovea from best to worst, on:

a) Color vision: Fovea, parafovea, perifovea
b) Acuity: Fovea, parafovea, perifovea
c) Light sensitivity: Perifovea, parafovea, fovea

3) Imagine in an experiment you're comparing conditions A and B, and you hypothesize better performance in A than B. You find faster responses in A, and also a higher number of errors in A. Both effects are significant. Would you consider this study evidence for your hypothesis? Explain.
Here we have a speed-accuracy trade-off, with better speed for A, but better accuracy for B. Therefore we do NOT have evidence for our hypothesis.

4) Why is a within-subjects design typically preferred over a between-subjects design?
All (unforeseen) contributors of variance (e.g., age, IQ, time of day, etc. etc. etc.) affect both conditions equally, because all participants do all conditions. In a between-subjects design (where each condition is tested with a separate group of participants) we're not immediately sure of this.

5) Give an example of a situation where a between-subjects design is unavoidable.
Patient studies (testing patients versus healthy controls), or studies where a phenomenon can only be tested once per subject.

6) Rank sensory memory, short-term memory and long-term memory, from best to worst, on:

a) Capacity: Long-term memory, sensory memory, short-term memory
b) Longevity: Long-term memory, short-term memory, sensory memory

7) Which of the following is *not* a Gestalt principle?

A: symmetry
B: closure
C: proximity
D: common ground

8) Imagine a participant has an average response time (RT) of 2000 ms and an accuracy of 80%. What is the inverse efficiency score (IES)? Provide a calculation. 2000/0.8=2500

9) What is a potential benefit of inspecting RT density plots rather than just comparing means?
One can inspect whether a difference between conditions is expressed mostly in the higher or lower portion of RTs. From this one may infer that the cognitive locus of an effect (i.e., at which stage of processing the effect takes place) is late or early respectively.

10) The army has an entry exam where candidates have to distinguish target enemies from innocent civilians. Candidates get 200 trials, 100 of which are target enemies (the candidate would have to shoot) whereas the other 100 are innocent civilians (the candidate has to refrain from shooting).

Candidate A classified 80 out of 100 enemies as such, while classifying 20 out of 100 civilians as enemies.

Candidate B classified 100 out of 100 enemies as such, while classifying 50 out of 100 civilians as enemies.

Using signal detection theory, how would you calculate sensitivity (d') for both candidates? Provide all values that are needed in the calculation.
We need the proportions of hits and false alarms, as d' = z(p(hits))-z(p(false alarms)).
For candidate A, d' = z(0.8)-z(0.2). For candidate B, d' = z(1.0)-z(0.5).

Note that for any proportion, the corresponding Z score can be looked up in a table - but you won't need to do that on the exam!

11) In a staircase procedure, the task difficulty is adjusted less and less after each oscillation. Explain why this is important.
Without decreasing the step size, the task difficulty would just go up and down without homing in on a perfect fixed difficulty.

12) Provide two arguments against Expected Utility Theory
People make decisions that don't yield the most expected value. Casino's, smoking, etc.

13) In a linear mixed-effects model, you can have random intercepts and random slopes for participants. Explain what these two things mean.
Random intercept: things can differ from one another, irrespective of the condition.
Random slope: conditions may affect one thing differently than another thing.

14) What are two key defining properties of language (i.e., what sets 'language' apart from 'communication')?
- Language does not only comprise building blocks (as does communication), but also rules about how to combine those building blocks into new structures.
- The set of structures that can be built is infinite.

15) Many interfaces make use of predictions. For example, in Google Chrome, when typing the first letter of your name in a field, Chrome might automatically fill in your entire name, address, phone number, et cetera. Using at least two interface design principles, explain why this could be both good and bad.
Good: Whatever is out there in the visual field, I don't have to keep in memory. This frees up cognitive resources that can be spent on other things.
Bad: Google's predictions may not align with my intentions. More visual input leads to clutter.

16) In most swimming locations (e.g., beaches, lakes), colored flags communicate whether or not it is safe to swim, whether certain things need to be taken into account (e.g., presence of jellyfish, bacteria), et cetera.

Jasmine theorizes that adding icons to the flags (e.g., an icon of a jellyfish on the 'jellyfish' flag) will improve comprehension, but only if viewers are within a 50m radius of the flag.

Using three criteria for theoretical quality, explain how well this theory scores in your opinion.

In terms of explanatory scope, the theory scores poorly, because Jasmine's hypothesis only pertains to icons on flags. A broader theory might have pertained to the impact of pictorial information in a more general sense for better scope.

In terms of parsimony, the theory scores relatively well, as it only contains two assumptions: a benefit of using icons, but also a distance constraint.

In terms of falsifiability, the theory scores well: the predictions are unambiguous and can be easily tested.

17) Robbie hypothesizes that when there are stripes on clothing, thicker stripes lead to higher aesthetic appraisal (i.e., how pretty people find the clothing). In his study Robbie measures this through pupil size, as prior studies have suggested that higher aesthetic appraisal leads to larger pupils. Robbie tests white dresses with black stripes.

Can you come up with a reason why pupillometry may be problematic in this setup?

Since Robbie is using black stripes, increasing the thickness of stripes also decreases the overall brightness of the stimulus. A darker stimulus will give less constriction (i.e. more dilation) of the pupil. So Robbie is likely to observe the hypothesized effect irrespective of whether the hypothesis is true: this is a confound.