

ECPS5003 Brain, Biology and Cognition
Indicative Exam Answers 2019-2020

SECTION A: ANSWER TWO QUESTIONS OUT OF FIVE

1. List any five major internal features of a neuron (5 marks).

- Any five of the following: Endoplasmic reticulum, Nucleus, Mitochondria, Cytoplasm, Ribosomes, Golgi Complex, Microtubules, Synaptic Vesicle, Neurotransmitters

2. Name the five major classes of anxiety disorders (5 marks).

- Generalised, Phobic, Panic, Obsessive-compulsive, Posttraumatic stress

3. List any five structures of the eye (5 marks).

- Any five of the following: Eye muscle, Ligament, Iris, Pupil, Lens, Cornea, Ciliary muscle, Sclera, Retina, Optic nerve, Blind spot, Fovea

4. Name the five structures protecting the human brain (5 marks).

- Any five of the following: Skull, Dura mater, Arachnoid membrane, Pia mater, Cerebrospinal fluid, Blood-brain barrier

5. List any five neurotransmitters (5 marks).

- Any five of the following: Glutamate, Aspartate, Glycine, Gamma-aminobutyric acid (GABA), Dopamine, Epinephrine Norepinephrine, Serotonin, Acetylcholine, Nitric oxide, Carbon monoxide, Anandamide, Pituitary peptides, Hypothalamic peptides, Brain-gut peptides, Opioid peptides, Miscellaneous peptides

SECTION B: ANSWER TWO QUESTIONS OUT OF FIVE

6. List five main aspects of schemata (5 marks).

- A way of storing info - not stored ad-hoc, Structures 'readied' for certain information, Relations between information intrinsically stored, Heavy influence on how information retrieved, Involve scripts containing info about sequences of events

7. Briefly describe the five stages of language production development in infants (5 marks).

- Stage 1 = Cooing 1-2 months – Long drawn out vowels or combinations of consonant-vowels – E.g. oooooooh or gaaaaaaaah
- Stage 2 = Babbling 6-10 months – More consonant-vowel combinations and repetitions – E.g. dadadada – Phonemes are beginning to be constrained by language exposure
- Stage 3 = First words 10-15 months – 50 words – A single word has many purposes e.g. juice (request, comment, lament) – holophrases

- Stage 4 = Two word utterances 18 months – Telegraphic speech – omit grammatical words e.g. milk gone.
- Stage 5 = Vocabulary explosion 24 months+ – Straight from 2 words to sentences! – Sentence structure and grammar develops • Is inconsistent at first • E.g. over generalise – more than one ‘cat’ are ‘catses’, playing with past tense makes ‘go’ becomes ‘goed’ – Grammar develops in a particular sequence • Words ending in –ing (notes verb) • Prepositions in/on • Plural -s – Consistent by age 4. Average 6 year old – 14,000-15,000 words (Clark, 1991)

8. List any five types of agnosia (5 marks).

- Any five of the following: Achromatopsia, Akinetopsia, Apperceptive, Associative, Astereognosia, Asomatognosia, Anosognosia, Autotopagnosia, Phonagnosia, Prosopagnosia, Auditory agnosia, Visual agnosia, Simultagnosia, etc.

9. List five main forms of forgetting from long-term memory (5 marks).

- Any five of the following: Trace-dependent Forgetting, Proactive Interference, Retroactive Interference, Decay, Repression, Motivated Forgetting, Directed Forgetting, Cue-dependent Forgetting, Encoding Specificity, State-dependent Forgetting, Context-dependent Forgetting, Memory biases, Misleading information

10. Briefly describe the reaction time data obtained in Collins and Quillian’s (1972) concept and property sentence verification tasks (5 marks).

- Reaction time data: Concept verification – ‘is a canary an animal?’ – ‘is a canary a bird?’ - faster RT • Property verification – ‘does a canary have skin?’ – ‘can a canary fly?’ - faster RT – Does an ‘earwig’ breathe? – slower RT

SECTION C: ANSWER TWO QUESTIONS OUT OF FIVE

Whilst bullet points are provided in these indicative answers, you were expected to write in appropriately structured sentences and paragraphs in the exam in order to produce a coherent essay. Also, these indicative answers should not be considered exhaustive, but simply as the basics that should have been covered.

11. Discuss the main eight biopsychological paradigms of animal behaviour and explain what they tell us about human functioning (20 marks).

- Assessment of Species-common behaviours: those displayed by all members of the species: e.g., grooming, eating, building nests, etc.). • Main tests
- 1. Open-field test: place animal in empty chamber & record activity (does it move around or stay close to wall, how much droppings it produces, etc.).
- 2. Tests of Sexual Behaviour.
- 3. Tests of Aggressive and Defensive Behaviour: Colony-intruder paradigm: examine no. of combat encounters between dominant alpha male of established colony & smaller male intruder. • Dominant alpha is aggressive: biting, putting hair upright. • Intruder is defensive: goes up on back legs to defend from biting & tries to push alpha away with its

front paws. • Elevated plus maze: a maze mounted 50cm from the ground, two arms of maze have sides while other two do not • Amount of time rat spends in closed arms rather than the open edge arms is compared. • Giving rat anti-anxiety drugs increases amount of time spent in open arms of maze: used for understanding usefulness of anti-anxiety drugs in humans?

4. Traditional Conditioning Paradigms: • We can infer about the sensory, motor, motivational, and cognitive state of an animal from its ability to learn and perform various responses. • Pavlovian conditioning (pairing an unconditioned stimulus with a conditioned stimulus) • Operant conditioning & reinforcement.

Semi-natural Animal Learning Paradigms:

5. Conditioned Taste Aversion: pairing something that makes an animal ill with food so they learn to avoid it. • This really challenged traditional learning paradigms because taste aversion can be established after a single trial.

6. Radial Arm Maze: place food at the end of the same arms. • Rat learns not to bother looking in the other arms. • Shows their spatial ability is good because all the arms look the same, so they have to orientate themselves to the whole room. • When the maze is rotated their performance is disrupted.

7. Morris Water Maze: rat must find hidden escape platform in an opaque pool of water. • Even when rat is placed in different places around the pool it quickly learns route, using spatial cues from the room. • Brain lesions disrupt ability and in severe cases the rat can be swimming around in circles for a long time even if they are placed in the same starting point on a trial where they successfully found the platform previously.

8. Conditioned Defensive Burying: give rat a single aversive stimulus (e.g., a shock/blast of air) delivered from an object. • They then spray their bedding/hay at the object to cover it. • Anti-anxiety drugs decrease amount of burying behaviour.

12. Describe the characteristics and causes of epileptic seizures and evaluate the methods used to diagnose and treat the condition (20 marks).

- Primary symptom is seizures, but not all who have seizures have epilepsy • Epileptics have seizures generated by brain dysfunction • Affects about 1% of the population • Difficult to diagnose due to the diversity and complexity of epileptic seizures. Types of seizures • Convulsions – motor seizures: involve tremors, rigidity, loss of balance and consciousness. • However, others involve merely subtle changes of thought, mood, or behaviour •

Causes • Brain damage • Faulty Genes – over 70 have been linked so far • Faults at inhibitory synapses, particularly GABA where neurons end up just firing in synchronized bursts. • Diagnosis • EEG – electroencephalogram • Why?.....Seizures are associated with high amplitude EEG spikes during an attack.

Some epileptics experience psychological changes before a convulsion – known as auras • Such as a smell, hallucination, or feeling • Aura's nature suggests the epileptic focus • Warns epileptic of an impending seizure • Once diagnosis is given, it's usual to assign the epilepsy to one of 2 categories:

Partial epilepsy – does not involve whole brain • Generalized epilepsy – involves the entire brain.

Simple • Symptoms are primarily sensory or motor or both • Known as Jacksonian seizures after neurologist Hughlings Jackson • Symptoms spread as epileptic discharge spreads.

Complex • Often restricted to the temporal lobes (temporal lobe epilepsy) • Patient engages in compulsive and repetitive simple behaviours (automatisms) • More complex behaviours seem normal & although conscious they do not have recollection of seizure.

Grand mal • Loss of consciousness • Loss of Equilibrium • Violent Tonic-clonic convulsions • Rigidity (tonus) • Tremors (clonus) • Petit mal • Not associated with convulsions • Instead there is a disruption of consciousness associated with cessation of ongoing behaviour • The EEG of a petit mal seizure is different from other types: it is a bilateral symmetrical 3 per second spike and wave discharge.

No cure, but frequency and severity can be reduced by antiepileptic medication (Rogawski & Löscher, 2004). However, these types of medication have severe side effects (Toledano & Gil-Nagel, 2008). Brain surgery is performed in grave situations (Guerrini et al., 2008).

13. Describe the symptoms and causal factors of schizophrenia and discuss the development and limitations of the dopamine theory (20 marks).

“Splitting of psychic functions” • Breakdown of integration of emotion, thought, action

• Affects ~1% of the population • Diverse & complex: multiple types with varied profiles

• Can overlap with other psychiatric disorders & even change during progression.

• Symptoms can be classed as either:

• Positive: represent an excess or distortion of normal function • Negative: represent a reduction or loss of normal function. • Positive symptoms: 1. Delusions (of being controlled, persecution, or grandeur), 2. Hallucinations (imagine voices), 3. Inappropriate affect (incorrect emotions for context), 4. Incoherent speech/thought, 5. Difficulty performing everyday tasks, 6. Lack of personal hygiene

• Negative symptoms: 1. Affective flattening (absence of emotional expression), 2. Alogia (no speech), 3. Avolition (absence of motivation), 4. Anhedonia (unable to experience pleasure).

Causal Factors in Schizophrenia • Evidence for a genetic contribution • Inherit an increased risk for the disorder but experience may also influence it developing • Multiple causes • Several different chromosomes implicated • Associated with various early issues – birth complications, infections, autoimmune reactions, toxins, traumatic injury, stress • Interference with usual development of susceptible individuals may lead to the disorder.

Discovery of the First Antipsychotic Drugs • Chlorpromazine: originally developed as antihistamine to counteract swelling from surgery • Surgeons noticed its calming effect, so given to calm agitated schizophrenics & to activate emotionally blunt schizophrenics • Does not cure schizophrenia, just reduces severity. • Reserpine: also found to be effective, but no longer used due to dangerous side effects. • Although chemical structure of both were different, their effects were similar (i.e., no effect for 2-3 weeks, also Parkinson-like motor effects were seen), suggesting they were both working through the same

mechanisms. Dopamine Theory of Schizophrenia • 1960 – link between dopamine and Parkinson's disease established • Striatum depleted of dopamine, suggesting disruption of dopaminergic transmission might produce Parkinson's disease. • Due to this & already established relationship between symptoms of Parkinson's & anti-schizophrenic effects of chlorpromazine and reserpine, it was suggested anti-schizophrenic drug effects are produced in same way. • Led to development of dopamine theory – too much dopamine causes schizophrenia & conversely, anti-schizophrenic drugs exert effects by decreasing dopamine levels. • Supported by fact that: • Reserpine depletes brain of dopamine and other monoamines by making vesicles leaky • Chlorpromazine antagonizes dopamine activity by binding and blocking dopamine receptors – So, both antagonize transmission of dopamine but in different ways. Lack of activity at postsynaptic receptors sends feedback signal to presynaptic cells to increase release of dopamine. • This led to revision of the dopamine theory • Instead of high dopamine levels, the main factor is the high levels of activity at dopamine receptors. • 1970s: degree to which various anti-schizophrenia drugs bind to dopamine receptors was assessed. • Radioactively labelled dopamine added to samples of dopamine-receptor-rich neural membrane obtained from calf striatum • Unbound dopamine molecules rinsed away & amount of radioactivity left was measured to obtain number of dopamine receptors. Drugs ability to block binding of radioactive dopamine was assessed - assumed drugs with high affinity for dopamine receptors would leave fewer sites available for the dopamine. • Chlorpromazine & others had high affinity for dopamine receptors whereas ineffective drugs had low affinity..... • Except for haloperidol: very potent but had low affinity. • Solution: came from discovery that dopamine binds to more than one receptor subtype – 5 have been identified. • Chlorpromazine & others bind effectively to D1 & D2 receptors, whereas haloperidol bind effectively to D2 but not to D1. • This discovery led to further revision suggesting schizophrenia is caused by hyperactivity at D2 receptors rather than dopamine receptors in general.

Limitations of the Dopamine Theory • Four key discoveries about the neural basis of schizophrenia cannot be explained by the D2 theory.

1. Other receptors are involved: glutamate, GABA, serotonin. • Evidence from studies on LSD, which produce schizophrenia-like symptoms by acting on serotonin & glutamate receptors. • Atypical neuroleptics, such as clozapine has affinity for D1, D4, & serotonin receptors but not for D2.
2. Neuroleptics block D2 receptors within hours but it takes weeks to alleviate symptoms. • Time difference suggests blockage of D2 receptors is not only aspect involved.
3. Schizophrenia is associated with widespread brain damage, & meta-analysis of studies has shown reduced volume in 50 different brain regions. • Two aspects about pattern of brain damage observed that causes problems for the dopamine theory: A. Little evidence of damage to dopamine circuits B. Theory does not explain why there is diffuse damage
4. Neuroleptics only marginally effective. • If dopamine theory was correct neuroleptics should be effective to treat all patients. • They only help with some symptoms not others: • Conventional neuroleptics (D2 blockers) are effective for positive symptoms, while negative symptoms might be caused by brain damage.

14. Critically discuss the causal factors, brain pathology, theories, and treatments of affective disorders (20 marks).

Affective Disorders: Depression & Mania • Depression: normal reaction to loss, abnormal when it persists or has no cause. • Experience anhedonia • Unable to meet essential requirements of daily life • Mania: overconfidence, impulsivity, distractibility, and high energy for no apparent reason. • When extreme it is a clinical problem: wake up in total enthusiasm with nonstop talking that switches rapidly between topics & overconfidence can lead to disaster. Affective disorders: • Psychiatric disorders characterized by mood or emotion disturbances. • Known as mood disorders • Depression and mania • Can be seen as opposite to each other but many depressive patients can experience periods of mania. Types of depression • Unipolar & Bipolar • Reactive (triggered by negative experience) • Endogenous (from within with no apparent cause).

Causal Factors in Affective Disorders • Genetic factors contribute to differences. • Twin studies suggest concordance rate of ~60% for identical twins & ~15% for fraternal twins regardless if brought up together or apart. • Concordance higher for bipolar than unipolar. However, most research on causal role of experience on affective disorders focuses on stress. Although evidence suggests depression is a stress-related disorder, evidence linking them is sparse. • Stress can trigger attacks in those already depressed but little evidence showing stress increases susceptibility. • Extreme stress is more likely to cause post-traumatic stress disorder (PTSD) than depression. • Two affective disorders where the cause is more apparent due to timings of the attacks: 1. Seasonal Affective Disorder (SAD) • Wintertime depression and lethargy, due to reduction of sunlight • Evidence: incidence rates different between N. America & Florida • Light therapy thought to reduce symptoms 2. Postpartum depression.

Four major classes of drugs used in the treatment of affective disorders 1. Monoamine oxidase inhibitors (MAOIs): Iproniazid • Increases levels of monoamines by preventing their breakdown by oxidase enzymes in cytoplasm of neuron • Must avoid foods high in tyramine – “cheese effect” • Normally these foods have little effect on blood pressure because tyramine is metabolized in the liver by MAO, but people who take MAO inhibitors & eat food containing tyramine run risk of stroke caused by surges in blood pressure. Tricyclic antidepressants – Imipramine • Chemical structure includes 3 rings of atoms • They block reuptake of serotonin and norepinephrine – Thus, increasing levels of these in the brain • They are thought to be safer than MAOIs 3. Selective serotonin-reuptake inhibitors (SSRIs) • They are serotonin agonists that exert effects by blocking the reuptake of serotonin from synapses. • Include Prozac, Paxil, Zoloft, and others • No more effective than tricyclics, but side effects are few and they are effective at treating other disorders 4. Selective norepinephrine-reuptake inhibitors (SNRIs): effective & block reuptake of norepinephrine. Hollon et al. (2002) compared efficacy of various pharmacology treatments for depression and found they were about the same for MAOIs, tricyclics, & SNRIs: • ~50% of clinically depressed patients improved • But a control group showed a 25% improvement • So, really only 25% of the depressed group were helped. • Kirsch et al. (2008): meta-analysis indicated that placebo was about 82% as effective as anti-depressants in severely depressed individuals • Drugs even less effective for mild to moderately depressed individuals. MRI of bipolar patients shown reductions in overall brain size and particularly the amygdala, cingulate cortex, and prefrontal cortex. •

But certain brain structures found to be of reduced size in one study is of normal size in other studies.

- Not all patients with bipolar suffer from same disorder?
- Two structures are found to be abnormal in many studies: amygdala and anterior cingulate cortex.
- Connections between these also disrupted in patients with affective disorders.

Monoamine theory of depression: Suggests depression is associated with underactivity at serotonergic and noradrenergic synapses. Support provided by autopsy: serotonin and norepinephrine receptors more numerous in brains of deceased clinically depressed individuals who had not had pharmacological treatment whilst alive, which implicates a deficit in monoamine release.

- When not enough amount of a neurotransmitter is released at a synapse, there are usually compensatory increases in the number of receptors for that neurotransmitter – called Up-regulation.
- However, overall support for the monoamine theory of depression is weak and not all patients respond to monoamine agonists.

Diathesis-stress model of depression: Suggests some people inherit a diathesis (genetic susceptibility) incapable of initiating the disorder by itself.

- If susceptible people are exposed to stress early in life their systems become permanently sensitized and end up over reacting to mild stressors for the rest of their lives.
- Diathesis + stress = depression
- Support is indirect: depressed people...
- Tend to release more stress hormones. Also, fail the dexamethasone suppression test:
- Assesses adrenal gland function by measuring how cortisol levels change in response to injection of dexamethasone....
- which is an exogenous steroid that provides negative feedback to the pituitary gland to suppress the secretion of adrenocorticotrophic hormone.
- Weakness of theory:
- Evidence of early stress based on recollections of distant past - likely faded or perhaps even distorted
- May not be any way of confirming the events recalled.
- Sometimes there is no evidence of excessive early stress in the lives of a number of depressed patients.

Treatment of depression with brain stimulation. Sleep deprivation

- More than 50% of depressed patients improve after one night of sleep deprivation
- Depression returns with normal sleep pattern
- Not explained by any current theory.

Exercise

- Helps reduce depression
- Increases adult hippocampal neurogenesis
- Findings suggests that depression may be caused by reduced adult hippocampal neurogenesis.

15. Critically compare the “what vs. where” and the “Control of behavior vs. conscious perception” theories to explain the functions of the ventral and dorsal pathways of visual processing (20 marks).

Dorsal Stream: pathway from primary visual cortex to the dorsal prestriate cortex & posterior parietal cortex.

- The “where” pathway (location and movement), or
- The pathway for control of behavior (e.g., reaching).

Ventral Stream: pathway from primary visual cortex to ventral prestriate cortex & inferotemporal cortex

- The “what” pathway (color and shape), or
- The pathway for conscious perception of objects.

Ungerleider and Mishkin (1982). Evidence for “Where” vs. “What” theory...

- Damage to some areas of cortex may abolish certain aspects of vision while leaving others unaffected.
- Patients with damage to posterior parietal cortex have difficulty accurately reaching for objects but are able to describe them well.
- Patients with damage to inferotemporal cortex have no difficulty reaching for objects but cannot describe them.
- See Ungerleider and Haxby

(1994). Instead of seeing these as “where” & “what” pathways, • Goodale & Milner (1992): difference is not in the kinds of info they carry but in the use that the information is put to. • Dorsal function: direct behaviour interactions with object • Ventral function: mediate conscious perception of objects • “Control of behavior” vs. “conscious perception” theory. The “Control of behavior” vs. “conscious perception” theory can explain two major neuropsychological findings that are the foundation of the “What” vs. “Where” theory..... 1. Patients with dorsal stream damage may do poorly on tests of location and movement because these tests involve performance measures. 2. Patients with ventral stream damage do poorly on tests of visual recognition because they involve verbal, and thus conscious awareness. Evidence for “Control of behavior” vs. “conscious perception” theory.... 1. Some patients with bilateral lesions to the ventral stream have no conscious experience of seeing but are able to interact with objects. 2. Some patients with bilateral lesions to the dorsal stream can consciously see objects but cannot interact with them. • Goodale (2004): suggests an evolutionary implication • The conscious awareness mediated by the ventral stream is what distinguishes humans from evolutionary ancestors. Evaluation: • More research is needed to characterize the functions of the streams. • Also, some suggest that the two streams do not function in isolation from one another (Konen & Kastner, 2008; Nassi & Calloway, 2009). • Thus, future research could focus on how they interact.

SECTION D: ANSWER TWO QUESTIONS OUT OF FIVE

Whilst bullet points are provided in these indicative answers, you were expected to write in appropriately structured sentences and paragraphs in the exam in order to produce a coherent essay. Also, these indicative answers should not be considered exhaustive, but simply as the basics that should have been covered.

16. Critically discuss Henke’s Processing-based model (2010) of long-term memory and explain how it differs to the traditional system-based accounts (20 marks).

Henke (2010): rejects consciousness as criteria for distinguishing between memory systems. – Instead: systems should be identified on the type of processing involved – she proposed 3 basic modes: 1. Rapid encoding of flexible associations: involves episodic memory & involves the hippocampus. 2. Slow encoding of rigid associations: involves procedural & semantic memory and involves the basal ganglia. 3. Rapid encoding of single/unitised items: involves familiarity in recognition memory and depends on parahippocampal gyrus. Supportive evidence for Processing Accounts • Associative learning can occur without conscious awareness (Hannula & Greene, 2012). • Duss et al. (2011): presented face-occupation pairs below level of conscious awareness (e.g., Doctor, Artist) – When faces only presented again in test phase, Ps able to classify them on regularity of income and length of education – How? = Based on subliminally presented occupation in study phase. Henke et al. (2003): conducted the face occupation study with the use of fMRI: 1. Hippocampal activation during non-conscious encoding of face-occupations pairs 2. Hippocampal activation during non-conscious retrieval of occupation associated with faces on the memory test. • These findings support the first prediction of Henke’s model: – Hippocampus is involved in unconscious and conscious learning. Support for Henke’s second prediction: – Patients with hippocampal damage should find it

difficult to form associations regardless of whether learning is conscious or not – To test this, Ryan et al. (2000): used a task that involved forming associations through implicit/unconscious learning. Ryan et al. (2000): Amnesiacs & healthy controls presented with colour images of real scenes in 3 conditions while eye movement recorded to examine eye fixations in critical regions: 1. Novel scenes 2. Repeated old scenes 3. Changed old scenes – Healthy controls looked at critical region (manipulated portions) of changed old scenes compared to other conditions – Amnesiacs did not – why?: They failed to form associations between objects and their locations. • However, there are discrepancies on whether patients are tested with verbal or perceptual associations (see Verfaellie et al., 2013), but the reasons for these differences are not known. Support for Henke's third prediction: – I.e., that the hippocampus is not directly involved in familiarity judgements in recognition memory. – This comes from the explanation that brain damage often includes other parts adjacent to the hippocampus. – These adjacent areas are associated with familiarity (e.g., the perirhinal cortex). Support for Henke's third prediction: – Aggleton et al. (2005): Tested an amnesic patient (KN) with hippocampal damage but no damage to the perirhinal cortex. – He was unable to perform as well as healthy controls on recognition tasks but was comparable in performance on familiarity tasks. Processing Accounts: Evaluation • Strengths: • Can help explain the neuroimaging evidence. • Does not rigidly focus on the distinction between declarative and non-declarative systems. • Better flexibility: can help explain why some tasks use different processes depending on the person and the study conditions. Limitations: • It does not always make specific predictions – Can be “fuzzy”. • Devising specific tests to examine its assumptions can be difficult. • Must always keep in mind that the traditional memory systems approach could be developed to account for new findings. Is the systems-based account still viable?: • Evidence for separate LTM systems also comes from the fact that different types of information can be forgotten from LTM and at differing rates: • Baddeley (1997): suggested that the forgetting rate is unusually slow for continuous motor skills e.g., riding a bike, compared to others. Most research suggests forgetting is slower in implicit memory: – Mitchell (2006): Ps shown pictures • 17 years later shown fragments of the pictures • Yet still able to identify them. – Suggests very good long-term implicit memory. – Explicit memory was poor – some Ps did not even remember taking part in the study.

17. Critically discuss how schemas, misinformation, and reconstructed memories impact what we remember (20 marks).

Schemas in memory representation • Idea that memory is ‘readied’ for certain information • We don't place information into a ‘blank slate’ storage system – Knowledge aiding new knowledge • This allows us to store more efficiently – Greater coherence of information – Associations in memory – Better performance in using/retrieving. Why is information easier to retrieve if stored in schema or concept? – Can simply activate a global schema E.g. ‘Ironing’ • Top-down processing from the global concept – Activation based/connectionist views (e.g. Collins & Loftus, 1975; McNamara, 1992): • Bottom-up processing • Activation of one part of schema also activates the other components of the schema • E.g. ‘Sitting down’ in restaurant schema also activates ‘looking at the menu’ – Ultimately recall many pieces of information – Relates to ‘chunking’ of information (Miller, 1958) • Many pieces of information stored and recalled as one. Schema effects in

LTM • Storing information in schema can cause errors in memory retrieval • Schema-consistent information may be activated in memory – False positives (recall information not present in reality) • Schema-inconsistent information may not be activated – False negative (fail to recall) • New influences on how memory organised – Misleading information (after encoding). Bartlett (1932): our memory is influenced by expectations because we possess numerous schemas in long-term memory that distort memory. Tuckey and Brewer (2003 a,b) found people recalled information relevant to a bank-robbery schema (male, wears disguises, dark clothes) better than information irrelevant to it. They also interpreted ambiguous info as being consistent with their schema. Misleading information effect • Loftus & Palmer (1974) – Students viewed films depicting vehicle accidents – After each film, students asked to give an account of the accident they just saw – Questions were asked to elicit additional information. About how fast were the cars going when they ‘smashed’ into each other? – Manipulated word used in questioning – Clear effect of information given after encoding. Lost-in-the-mall Loftus and Pickrell (1995) • Participants read a list of childhood events that their family had corroborated as true • One of these events was actually false – Being lost in the mall for a considerable time when 5-6 years old and being helped by an elderly person and reunited with family • 25% of Ps believed this to be a true memory – Episodic autobiographical memory implied – Around 20% embellish the event with further ‘recalled’ details from ‘memory’.

Reconstructive memory • Memory is modified to conform to post-event information (Morton et al 1985) • This is termed the ‘destructive actualisation hypothesis’ – as new information destroys or over-writes actually stored memories • A bleak view of human memory – There may be no such thing as true memory – Or how can we tell from memory alone? – Relation to autobiographical memory? Aliens and false memories • Clancy et al (2002) studied 3 groups: – Abductees: no autobiographical memory for event – Abductees: memories had been ‘recovered’ – Non abductees • Gave them a critical lure test – Item consistent with schema – Exposed them to items such as ‘sour, sugar, honey, tart’ etc – Would they falsely recognise ‘sweet’ as the critical lure? Results (Clancy, 2002) • Recovered memory alien abductees: more likely to falsely recognise words not seen before • Argued that the problem could be one of source monitoring – Judging where information originated from: • Misattribute an internally generated memory as an externally generated memory • E.g. From TV or reality! • Makes more vulnerable to schema-effects?

18. Critically discuss and compare the Prototype and Exemplar theories of Categorisation (20 marks).

Rosch (1973) – prototype view – Categories are organised around central ‘prototypes’ (typical description) – Hold in memory this prototype which also has characteristic attributes – E.g. a prototype ‘chair’ in memory. In each category we come across there are potentially infinite instances, so the cognitive system needs to create a summary representation. • An average across all instances of a category. • The prototype incorporates the most typical aspects of the instances from a category. • Some category instances will be more typical than others depending on “distance” from category prototype – E.g., Robin more typical bird (thus closer to the prototype) than a penguin. Can make comparisons between new examples and category prototype to judge membership • Membership = similarity of an example’s attributes to the prototype list of

attributes • Make a judgement on how strongly similar • Allows for 'fuzzy' membership • E.g. Is a spider an insect? • Is a tomato a fruit? • View of categories as having fuzzy boundaries • Involves reasonable intuitions. Prototype is idea of ONE stored memory against which new examples are compared • Alternative is that categories represent all (or many) previously seen examples (exemplars) • E.g. Category 'chair' – Every example you have seen of a 'chair' incorporated • Incidental form of learning (non-deliberate) • How do we make category judgement with this view? • New example compared with previous examples held in memory – (Medin & Shaffer, 1978; Medin, Goldstone & Gentner, 1993). Exemplar view emphasises our learning • Highlights we don't 'know' of a category innately – Does a new-born know what a 'chair' looks like? – No, this is demonstrated with examples – Over time concept is developed – Also indicates that concepts can change – Each new example becomes an 'exemplar' can change the representation stored. Weakness with Exemplar theory: not all categories are equally good – e.g., chair is a fairly intuitive category but is that the case for say the Eiffel Tower? • Is 'exemplar theory' too cumbersome? – Compare every single example of category/concept? • E.g. All 'chairs' seen in forming and judging category? – Possible we convert this back to 'prototype' representation? – Evidence for 'prototypes' in recognition testing • Prototype not observed in examples -> highest recognition score (Hess, 1982; Hess & Slaughter, 1986) – Evidence that we still store specific exemplars within a category to form a concept • Category exemplars influence concept held in memory (Hess & Slaughter, 1986). Both predict similarity will determine classification: – Prototype: similarity to AVERAGE of instances – Exemplar: similarity to each individual instance • In many cases their predictions will be the same • It requires a clear category structure to identify situations where their predictions will differ. • But can all categorisation be reduced to similarity? Evidence from Category Variability • Rips (1989): Pizza/Coin experiment: – G1: asked if object 5 inches in diameter was more likely to be coin or pizza (Categorisation). – G2: asked to judge similarity of object to either coin or pizza (Similarity). – Size of object roughly ½ way between both. – Findings: • Ps in categorisation group judged object to be pizza, • Ps in similarity group judged object to be coin. – If categorisation is based on similarity, both groups should have provided the same answer. – Conclusion: The fact that they didn't suggests knowledge about the variability of sizes of objects influences decisions • Pizzas vary in size whereas coins must be in a constant size by law.

19. Critically discuss whether consciousness can be assessed, and with reference to split-brain patients discuss whether consciousness is unitary (20 marks).

Use Behavioural measures: Ask people to provide verbal report of visual experience – is this sufficient? • Lamme (2010): Our actual conscious experience is much richer than our reports. • We cannot report the mechanisms of the cognitive functions that occur when we think E.g., memory, attention • People's reports may also reflect the involvement of top-down processes (e.g., what they are expecting and not the actual experience, Kouider et al., 2010, 2012). Sperling (1960): presented visual arrays containing three rows of four letters each for 50ms, e.g., M X R J P N K T A G S Z • Ps could only report four to five letters, yet claimed to have seen many more. • Likely the visual info had faded before reporting • Since then others have further found that presenting a cue within two-seconds after the array disappears and before the next array appears improves performance (Lamme, 2010). • Block (2012): used this evidence to support his distinction between

access and phenomenal consciousness: • Access = can be reported & available to other cognitive processes • Phenomenal = raw, private experience. The Vegetative State • Behavioural criteria: – No evidence of awareness of self/environment – No response to external stimuli suggesting volition or purpose – No evidence of language comprehension • Functional neuroimaging reveals a different story – 23-year-old woman in vegetative state – Asked to imagine playing tennis or visiting household rooms • Only tennis instruction associated with supplementary motor area activation – which is the same as in healthy controls (Owen et al., 2006, 2007; Owen & Coleman, 2008; Owen, 2013). Sixteen patients tested on ability to respond to two commands – squeeze right hand or toes • In healthy Ps, this activates hand & toe motor areas respectively • Three patients showed similar activity • Impressive as this involves attention, language comprehension, working memory, & response selection (Cruse et al., 2011).

The issues and disagreements in different behavioural measures coupled with imaging research on vegetative patients suggest we should assess consciousness through neural correlates: Linking behavioural data to associated patterns of brain activity - Why? – Theoretically important & is a more direct measurement. 2. Neural Correlates of consciousness • Lamme (2010): Presentation of visual stimulus leads to rapid processing in visual cortex. – Starts with early visual cortex then proceeds to higher levels – He calls this a “feedforward sweep”, which is then followed by recurrent processing: • Recurrent processing = type of top-down processing involving feedback from higher to lower brain areas producing interactions among different areas. • Recurrent processing is accompanied by conscious experience while the feedforward sweep is not. Why?: A. The feedforward sweep involves fragmented processing (shapes, colours, motion, etc.) – The recurrent processing involves integrated processing of that information (Tononi & Koch, 08) B. Conscious visual experience is (usually) coherent & unambiguous even when the env. is ambiguous and obscured (O'Reilly et al., 2013). – Top-down processing associated with recurrent processing helps produce the coherence. Masking: used to prevent recurrent processing to assess its importance for conscious perception – Involves blocking processing/perception of an item by rapidly presenting second (masking) item immediately after it. • Fahrenfort et al. (2007) – Used masked and non-masked conditions and asked Ps to decide if a target had been presented. – Found EEG correlate of feedforward processing intact for masked stimulus (even if performance was poor) – No indication of recurrent processing. However, Fahrenfort et al.'s. research was correlational. – Therefore, does not show recurrent processing is essential for visual consciousness. • Research have thus used TMS: E.g., – Koivisto et al. (2011): Ps decide if pictures of natural scenes contained animals. – Disrupted recurrent processing after processing in the lateral occipital cortex had started – Findings: Conscious visual perception reduced – Although some evidence suggests conscious visual perception can occur without recurrent processing providing the task is easy (Koivisto et al., 2014). Limitations to Lamme's approach: 1. Only focuses on visual consciousness 2. Complexity of env. & task difficulty plays greater role in recurrent processing & consciousness 3. Evidence of recurrent processing in absence of conscious awareness (e.g., Thakral, 2011) 4. Usefulness overstated.

Is there just one consciousness? • Most would say yes but research with split-brain patients has been controversial. • Split brain patients have few connections between the two

hemispheres from cutting/damage of the corpus callosum • Evidence suggests there are some remaining interactions between hemispheres (e.g., Uddin et al. 2008) • But do they have two minds, each with their own consciousnesses? Is consciousness unitary: No - Sperry (1913–1994) • Claimed that split-brain patients had two consciousnesses • Right (“minor”) hemisphere • Left hemisphere dominant because it is involved in language processing. Yes - Gazzaniga et al. (2002) • Left-brain system is interpreter • Seeks explanation for internal and external events to produce appropriate response behaviour • Cooney & Gazzaniga (2003) Interpretive processes continue even in the face of limited information. Bayne’s (2008, 2010): Switch Model • There is a single stream of consciousness that “switches” between the two hemispheres • The hemisphere where consciousness resides at a given moment depends on the allocation of attention • Perhaps split-brain patients have two distinct streams of activity and only one stream is accessible at a given moment (Schechter, 2012). Evidence for dual-consciousness: Baynes & Gazzaniga (2000) • Split-brain patient VJ • Frequently dismayed by independent performance of her left and right hands Keenan & Gorman (2007) • Self-awareness generally associated with greater right than left hemisphere activations in healthy control Guise et al. (2007) • TMS applied to right prefrontal cortex disrupted self-perspective taking. Ability to recognise own face is an indication of self-awareness. • Uddin et al. (2005) found a split-brain patient could recognise her own face equally well whether presented to left or right hemisphere. • This indicates basic self-awareness in both hemispheres. Unitary consciousness evidence: Split-brain patients can function effectively. • They ensure env. info reaches both hemispheres by moving their eyes around. • Info from the left visual field goes to right hemisphere and vice versa. • Research by Trevarthen (2004): • Right hemisphere performed better on tasks involving perception of complex shapes, manipulations of geometric patterns and hand explorations of shapes. • Left hemisphere better at tasks involving language. Gazzaniga and LeDoux (1978) and Gazzaniga (1992) • Studied Paul S - Split-brain patient • Unusually well-developed right-hemisphere language ability • Showed limited consciousness in the right hemisphere • Argued left hemisphere interprets actions initiated by right hemisphere • The right contributes relatively little to the interpretation.

20. With reference to relevant theoretical accounts, critically discuss factors that can impact our judgement and decision making (20 marks).

Judgement: deciding or making an assessment on the likelihood of various events based on incomplete information. • Decision making: Selection between options – Often ultimately actions – Applied cognition • Judgement forms important initial part of decision making • However, with decision making, if full information is not available then a judgement is required. • With judgement what matters is accuracy, with decision making what matters is importance of the decision. We tend to change our mind about things when presented with new information. • Bayes’ theorem uses the relative probabilities of two hypotheses before data are obtained (prior odds), and we calculate the probabilities of obtaining observed data under each hypothesis (posterior odds). – Shown in the taxi-cab problem (Kahneman and Tversky 1972). What is rationality? It can depend on what we define as rational, but at one time it was believed that behaving rationally involved selecting the best option. • This assumption was built in to Normative models – focuses on how people should make optimal decisions rather than how they actually made them. – Normative is basically the

ideal. • Choosing between options involves calculating the one with the highest expected utility (value) – How probable outcome $\times$ utility of outcome (von Neumann & Morgenstern, 1944; 1947). Issues with this approach • Utility (value) is often subjective – If you had no money or £500 debt you would likely be more happy with £600 for certain – Therefore your motivations are not necessarily driven by value of monetary outcome (or objective utility) but value relating to other circumstances • Need to appraise the value of all options (especially when more options available)? – Maximising: • To find the absolute ‘best’ option • Takes effort and is exhaustive – Satisficing: • Targeted to most crucial or salient elements not all • Minimal requirement met (Simon, 1960). Certainty and risk • An outcome that is a ‘near’ certainty (e.g. 95%) and positive is considered less attractive than it should be (as aware of 5% may not happen) • An outcome that is unlikely (e.g. 5%) but positive is considered more attractive than it should be (as aware of 5% chance will happen). • Sensitivity to small change but from certain to uncertain Kahneman and Tversky, 1984. Prospect theory: Kahneman & Tversky (1979; 1984) 1. Individuals identify a reference point representing their current state. 2. Individuals are more sensitive to potential losses than to potential gains; this is loss aversion. • Whether decision about ‘gain’ or ‘loss’ can effect decision, regardless of objective expected value – We are risk averse when seeking gains – We are risk seeking when minimising losses – Against the ‘normative’ view of process • What we should do in each case • Optimal decision making. Framing/Context • The manner/way in which information is provided to us can influence our decisions. • It often involves our decisions being influenced by irrelevant aspects of a situation. Presenting information in different ways can effect the choices people make – Can frame in terms of certainty or uncertainty – Can frame in terms of losses or gains – Other ways to frame context of a choice? Framing effects: Mandel and Vartanian (2011) found that when all programmes were completely described the framing effect disappeared. • Wang (1996) has argued that social and moral factors not considered by prospect theory can influence performance on this type of task – Ps choose between definite survival of 2/3 of patients, which is known as the deterministic option, and a 1/3 probability of all patients surviving and a 2/3 probability of none surviving, which is known as the probabilistic option. Almashat and colleagues (2008) looked at eliminating the framing effect by presenting medical scenarios involving cancer treatments. The effect disappeared when Ps were asked to list the advantages and disadvantages of each option and justify their decision. Heuristics (Kahneman & Tversky, 1973, 1974, 1982) • ‘Rules of thumb’ that simplify and speed decision making processes. • “Strategies that ignore part of the information with the goal of making decisions more quickly, frugally, &/or accurately than more complex methods”. Gigerenzer & Gaissmaier, 2011, P.454. – Do not guarantee maximal decision – E.g. Old looking pubs will sell better beer inside • Heuristics and influences in reasoning researched: – Representativeness – Availability – Anchoring and adjustment – Could also be referred to as ‘biases’ in decisions. Judgement Theories • Support Theory: Tversky and Koehler (1994) – based in part on the availability heuristic – Assumes any given event will appear more or less likely depending on how it is described. – More explicit description of an event typically regarded as having a greater subjective probability because it: • draws attention to less obvious aspects; • overcomes memory limitations. – But, explicit description can reduce subjective probability if it & lead us to focus on low-probability causes (Sloman et al., 2004). – Providing an explicit description can reduce subjective probability by making it more effortful to comprehend an event

(Frederick, 2011). Dual-Process Models: Kahneman (2003) & De Neys (2012). – Judgements depend on processing within 2 systems: • System 1: intuitive, automatic and immediate (e.g., heuristics). • System 2: an analytical, controlled and rule-governed system. • System 1 rapidly generates intuitive answers that are monitored or evaluated by System 2. • Since System 2 is more cognitively demanding, processing in this route takes more time. Dual-process Models – Evidence: • Ps who used System 2 to solve the Linda problem took 40% longer than those who used only System 1 (De Neys, 2006). • Ps take longer to answer incongruent problems when System 1 and 2 processes would produce different answers (De Neys & Glumicic, 2008). • Neither system is used for some problems (Pennycook & Thompson, 2012). • Usage of System 1 and System 2 processing depends more on how information is presented (Chun & Kruglanski, 2006). • The model explains individual differences in judgement. • But it is based on the assumption that most people rely almost exclusively on System 1, errors can also occur in System 2, and many of the assumptions have been shown to be incorrect or oversimplified.