Physiology week 1 – Introductory VIVAs

TOPIC: Cyclic AMP _____NUMBER: _____

OPENING QUESTION	Describe the synthesis and metabolism of cAMP	**PROMPTS**	**COMMENTS**
POINTS REQUIRED	1. Formed inside the membrane	1	2/3 to pass
	2. ATP is converted to cAMP via adenyl cyclase	2	
	3. Metabolised by phospho-diesterase	3	
SECOND QUESTION (if needed)	Discuss the function of cAMP.		
POINTS REQUIRED	1. Intracellular second messenger	1	
	2. Stimulate protein synthesis	2	
	3. Activate an intracellular enzyme system in the neurone	3	
	4	4	

TOPIC: Cell Transport_____NUMBER: _____

OPENING QUESTION	List some ways in which substances are transported across cell membranes	**PROMPTS**	**COMMENTS**
POINTS REQUIRED	1. Exocytosis	1	3/5 to pass
	2. Movement across ion channels	2	
	3. Endocytosis	3	
	4. Active transport	4	
	5. Secondary active transport	5	
SECOND QUESTION (if needed)	Describe the sodium potassium pump.		
POINTS REQUIRED	1. Energy dependent (ATP to ADP)	1	2/2
	2. 3 Na+ ions going out in ex-change for 2 K+ going into cells via a carrier protein	2	
THIRD QUESTION (if needed)	Give an example of secondary active transport		Bonus points
POINTS REQUIRED	1. Co-transport eg: glucose with sodium, sodium with amino acids	1	
	2. Counter-transport system: eg. Sodium counter-transport with calcium and hydrogen ions	2	

1.3 Principles of intercellular communication	How do cells communicate one to the other?	Cell to cell via **gap junctions**. **Chemical messengers** in ECF: **neural** (neurotransmitters at synapses), **endocrine** (hormones and growth factors), **paracrine** (products of cells diffuse to neighbours). **Autocrine** = cell secretes messenger that acts on itself. Same chemical can function in several ways. **Juxtacrine** = molecules attached to membrane that attaches to another cell.	3/5
	How do receptors respond to variations in messengers?	Receptors change with physiological variations: **messenger in excess -> decrease receptors** (down regulation, internalisation, desensitisation); **deficient messenger -> increase receptors** (up regulstoin). Exception is Angiotensin 11 in adrenal cortex.	
	How do messengers act?	*Via ion channels (Ach, nicotinic, noradrenalin.); transcription of mRNAs (steroids, thyroid hormone.); activation of phospholipase C (angiotensin 11, noradrenalin. vasopressin); production of cAMP (noradrenalin); production of cGMP; increased activity tyrosine kinase (insulin); increased activity serine or threonine kinase (TGF, MAPK).*	
3.3 Transport across cell membranes	Describe the mechanisms of transport across cell membranes?	**Exocytosis, endocytosis, ion channels**, Carrier proteins, primary and secondary active transport. Exo: ER to Golgi apparatus to granules/vesicles to cell membrane. Endo: phagocytosis, pinocytosis = liquid.	
	Give an example of active transport	Ion channels open, voltage gated, ligand (molecule) gated. Transport proteins for active transport (vs chemical, electrical gradient), facilitated diffusion; uniports for one substance, symports require two together (eg Na + glucose), antiports exchange one for another (eg Na for K).	

TOPIC: Transport Across Cell Membranes (inc Na-K Pump) **NUMBER:**

OPENING QUESTION	**Describe the structure and function of the sodium potassium ATP ase pump**	**COMMENTS**
POINTS REQUIRED	1. **Antiport: catalyses hydrolysis of ATP to ADP to move 3 Na out cell in exchange for 2 K in.** **Maintains electrochemical gradient ECF (Electrogenic pump 3+ out / 2+ in = net 1+ out)** and is large part of basal energy consumption - 33% energy use by cells (70% neurons) **Coupled to transport other substances** (secondary active transport) e.g glucose in SI mucosa,	Need 3 / 5 (1 or 2, 3, 4 or 5)
	2. α and ß subunits which pass through cell membrane Both heterogeneous α subunit intracellular binding sites for Na & ATP α subunit extracellular binding sites for K & ouabain ß subunit has no binding sites Na / K Variable distribution of α 1 + 2 and ß 1+2 subunits	
	3. When Na binds to α subunit, ATP also binds. ATP is converted to ADP causing change in protein configuration extruding Na out of cell. **K then binds extracellularly dephosphorylating α subunit which returns to original configuration releasing K into cytoplasm**	
PROMPTS	**Describe the structure of the sodium potassium pump** **Describe how the sodium potassium pump works** **What are the effects of the sodium potassium pump ?**	

TOPIC: Body composition_____ **NUMBER:** _____

OPENING QUESTION	How is water distributed through the body compartments?	**PROMPTS**	**COMMENTS**
POINTS REQUIRED	1 TBW is 60% of body weight	How much water is in the intracellular space?	
	2 ICF 2/3 of TBW		ICF/ECF proportions needed
	3 ECF 1/3 of TBW		
	4 Interstitial ¾ of ECF		
	5 Plasma ¼ of ECF		
SECOND QUESTION	How do age and gender affect total body water?		
POINTS REQUIRED	1 Decreases with age		
	2 Higher in males		