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| ***Year 12 Biology Unit 4******Homeostasis: Student Checklist*** |
| ***Homeostasis is the process by which the body maintains a relatively constant internal environment; it involves a stimulus response model in which change in external or internal environmental conditions is detected and appropriate responses occur via negative feedback***  |
| Image | Stimulus and Response Model and Negative Feedback Loops |
| Image | Components of the homeostasis model: stimulus, receptors, control centre/modulator, effector, response and negative feedback: i.e. the response occurs in the opposite direction to the original stimulus. |
| Image | Negative feedback brings about homeostasis and keeps the internal environment at a near constant level. |
| ***Changes in an organism’s metabolic activity, in addition to structural features and changes in physiological processes and behaviour, enable the organism to maintain its internal environment within tolerance limits (temperature, nitrogenous waste, water, salts, and gases)***  |
| Image | Tolerance limits: Organisms have a limit to the range of environmental factors which they can survive plant and animal examples |
| Image | Outside their tolerance limits organisms experience stress and may die use plant and animal examples  |
| Image | Sensitivity of cells to environmental changes function within narrow limits of pH and temperature  |
| Image | Organisms cannot tolerate waste accumulation due to osmotic damage  |
| Image | Relate what happens at the cellular level to the functioning of the whole organism |
| ***Thermoregulatory mechanisms include structural features, behavioural responses and physiological mechanisms to control heat exchange and metabolic activity; animals can be endothermic or ectothermic*** |
| Image | Structural e.g. fur, blubber and SA:Vol |
| Image | Behavioural (including burrowing, basking, nocturnal lifestyle)  |
| Image | Physiological mechanisms (e.g. sweating, hibernation, estivation, counter current circulation) and give examples of each |
| Image | Some endotherms can vary their body temperature within a large tolerance limit e.g. camels and some birds helps with reducing water loss to control body temperature  |
| Image | Ectotherms use behavioural and structural adaptations for regulating body temperature , its body heat will fluctuate with that of the external environment |
| Image | Endotherms regulate body temperature metabolically despite fluctuations in the environmental temperature E uses a combination of metabolic (physiological processes), structural and behavioural changes |
| Image | Heat is lost and gained from the body as a result of conduction, convection, radiation and evaporation (explain how!) |
| ***The type of nitrogenous waste produced by different vertebrate groups can be related to the availability of water in the environment*** |
| Image | Cover aquatic and freshwater fish, land mammals, reptiles and birds; relate to levels of and methods of water inputs, outputs, toxicity of 1. Ammonia highly toxic, small molecule, soluble in water diffuses readily into surrounding providing there is water available e.g. freshwater organisms
2. Urea larger molecule than ammonia (conversion requires energy), much less toxic than ammonia, highly soluble in water/requires water to eliminate, kidneys adapted to minimise water loss e.g. mammals, salt water fish
3. Uric acid large molecule requiring large amount of energy to produce, highly insoluble, so no water required to excrete therefore saves water, relatively non-toxic allows growth of embryo in egg, as waste accumulates but is non-toxic e.g. birds and terrestrial reptiles
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| ***Animals have a variety of behavioural, physiological and structural adaptations to maintain water and salt balance in terrestrial and aquatic environments*** |
| Image | Describe environmental difference and adaptations of aquatic and freshwater fish, land mammals, reptiles and birds; relate to levels of and methods of water inputs & outputs |
| Image | Contrast estuarine fish or fish that migrate from fresh to marine to fresh water during their lives e.g. salmon to those that remain in either fresh or marine waters |
| Image | Water inputs i. drinking and eating ii. produced through the process of cellular respiration  |
| Image | Water loss i. evaporation from respiratory surfaces ii. sweating (in mammalian endotherms where no or little fur) iii. faeces and urine  |
| Image | Factors affecting water gain and loss i. environment/availability of fresh water ii. structural characteristics of organism e.g. surface area to volume ratio, skin, scales, gills iii. physiological e.g. active transport of salts e.g. salt glands of marine vertebrates (birds and iguanas) |
| ***To maintain water balance and allow for gas exchange, xerophytes and halophytes have a variety of structural*** ***and physiological adaptations*** |
| Image | Adaptations of land plants to control water loss, maximise water collection and storage.  |
| Image | Describe how this may affect gas exchange and photosynthesis and plant physiology and behaviour |
| Image | Water gain must equal water loss in a mature plant or wilting and eventually cell death will occur  |
| Image | Water absorption through root hair cells (large surface area to volume ratio)  |
| Image | Water Loss evaporation from unprotected surfaces transpiration through stomatal pores  |
| Image | Factors that affect transpiration rates, temperature, wind, available surface area, humidity  |
| Image | Transpiration can cause cooling of the plant through the process of evaporation |
| Image | Adaptations to increase water gain and reduce water loss: i. Structural: Number and placing of stomata (e.g. underside of leaf to conserve water) ii. Size of leaves (reduced S/A in arid environment), pale colour to reflect heat iii. Sunken stomata to increase humidity in the pits and reduce water loss as decrease concentration gradient iv. Physiological: Control opening and closing of stomata – respond to light and water availability: early morning and afternoon open; close in middle of day or when water is scarce; some plants have leaves that fold to reduce water loss in desert (eg types of spinifex), some allow substantial dehydration (resurrection grass) v. Closing stomata decreases on photosynthesis and therefore plant growth rates |
| Image | Plants experience problems obtaining water in soils with a high salt content. These include:* Salt concentration in the soil exceeds that in the roots
* Therefore water moves from roots into the soil
* Water moves by osmosis
* To equal concentrations of salt inside and outside the root
* Therefore the plant losses water/dehydrates **or** plant needs to reverse this process to obtain water
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| Image | Adaptations of halophytes include:* Store salt in vacuoles in root cells so salt concentration in cell exceeds that in soil
* Accumulate salt in leaves/bladders/salt glands/bark and discard salt/leaves/ bladders
* Store salt in cell vacuoles which removes salt from cytoplasm
* Accumulate/store water in leaves/some parts of plant this dilutes salt content of cells in these parts of plant
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