BIOL1030 lectures & pracs by concept

Lecture/ staff	Lecture concepts	Concepts in Exam Q's
1 CEF	Intro to course Biodiversity is amazing & inspiring Biodiversity is decreasing	
2 CEF	Life as an ecologist Biotelemetry Crocodile movements	
3 CEF	*Challenge: biodiversity crisis* Extent of current loss in biodiversity Intro to causes of biodiversity loss Vertebrates feature prominently in biodiversity crisis Case study – amphibians	
4 CEF	Levels of biodiversity: genetic, species, ecosystem with examples which include the human body Endemism definition & examples Biodiversity hotspot – definition & importance Ecosystem function & services – broad definition Unity of life; all life has cells & DNA Importance of evolution & natural selection Domains of life - introduction	
5 CEF	Origin of life on earth History of life on Earth: 3 Eons, key steps in evolution of life Prokaryotes & Eukaryotes – basic differences in cells Endosymbiont theory - intro Benefits of multicellularity Cambrian explosion – description & evidence Colonisation of land; implications for life/evolution	
6 CEF	Key steps in evolution of vertebrates + examples Historic mass extinction events	
Prac 1	Develop dichotomous plant key; applied on field trip Leaf & stem structures; names, types	
7 LK	Characteristics used to identify: metazoa, insect & arthropoda Reasons why biodiversity is important to humans Ecosystem services – categories, definitions & examples Biology, society & careers – highlight links + options	
8 LK	Characteristics used to identify: micro-organisms, bacteria, plants & plant phyla Regulating ecosystem services: detailed descriptions & examples	
9 LK	Characteristics used to identify: fungi, archaea Autotroph & heterotroph definitions Supporting ecosystem services; detailed descriptions & examples International actions to combat biodiversity crisis – examples	
Prac 2	Describing plant diversity: learn to identify mosses and ferns, life cycles, apply detailed observation skills including use of dissecting microscope. Video assignment – filming, organising & ideas. Team skills – personal strengths of team members	
10 LK	Reasons species definitions are important/useful. Biological species concept; definition, pros & cons Morphological species concept; pros & cons Phylogenetic species concept; pros & cons Ecological species concept; pros & cons Hybridization; impact on biodiversity	
11 LK	Causes of change to DNA; basic intro including mutation, sexual reproduction, natural selection	

	Phylogenetic trees; create & interpret Homology & convergence; definitions Time as a factor in evolution; species differences Evolution happens to population not individuals	
12 LK	Communication; how to create a good video assignment	
Prac 3	Describing plant diversity: gymnosperms & angiosperms, seed diversity, dispersal methods & environmental requirements for all 4 plant groups. Team skills: expectations for professional team behaviour	
13 LK	*Challenge: Environmental Change* Climate influences species distributions Current rate of climate change Most organisms tolerate some environmental change Organisms respond to environmental change by dispersing; examples and limitations Five drivers of biodiversity loss; link to dispersal	
14 LK	Organisms respond to environmental change by modifying physiology & behaviour & phenology; definitions & examples Examples of influence of abiotic environment on physiology Populations respond to environmental change through genetic adaptation; definitions & examples	
15 LK	Ecosystems respond to environmental change via individuals & populations, changing community structure & composition; definitions & examples Bioclimatic models as predictors of species & ecosystem change Link to environmental management practices	
Prac 4	Applying biodiversity ID skills; forensic palynology (pollen and spores, microscope use and slide making). Library skills: research and evaluate credibility of information from library and websites. Team skills – negotiating conflict	
16 LK	The human body is a megadiverse ecosystem; definitions & examples Environmental change (internal & external) impact biodiversity of human body; examples, links to health	
17 LK	Revision	
FIELD TRIP	Learning definitions of various species interactions and identifying them in the field eg, competition, symbiosis, etc. Discuss impacts of disturbance to ecosystems and the impact on these interactions using various scenarios.	
18 RW	Sustainable harvesting – definition Factors to consider: pop size, precision, rate pop increase, rate harvesting, ethics Kangaroo example Fisheries examples: Orange roughy, blue fin tuna, *Sepiotuthus australis*, atlantic cod 1 in 4 fisheries have collapsed but we are eating more	
19 RW	Measuring pop size: definitions of distribution, dispersion, abundance, density Example: cane toad impact on northern quolls Estimating change in population size: definitions of demography, survivorship Example – red snapper	
20 RW	Life history – definition, size-number trade-off, investment in offspring, parental care Semelparity & iteroparity Example – northern quolls Movement patterns in northern quolls	
Prac 5	Impact of environmental change (copper pollution) on marine communities. Part 1 Activities: propose hypotheses; point count estimates; graph data; basic ID of marine benthic life forms; setting out tables for data collection in Excel. Biological concepts: disturbance to ecological communities, colonial & solitary organisms, free space, communities, intro to sampling, replication and random chance.	
21 RW	Generation time & life history variables Models of population growth: exponential, logistic, r and k species	

	Equilibrial v opportunistic species – characteristics Instrinsic population growth – density dependent & independent Effects on intrinsic growth rates: predation, competition, climate Examples: tadpoles, rhinoceros beetles Niche – fundamental and realised definitions Competition explanation – barnacle experiment	
22 RW	Sustainability via Marine Parks Fisheries do not readily recover from declines Marine Protected areas(MPA) – definition Benefits of MPAs: biomass, density, size & diversity Ecological interactions are important in determining success of MPAs for different species	
23 RW	Ecological networks and connects - definition, examples of adult v juvenile fish Spill over effects – what are they? Implications for park size and spacing using larvae & adult examples Example Georges Bank Cod closure to discuss benefits to industry and conservation	
Prac 6	Impact of environmental change (copper pollution) on marine communities. Part 2 Activities: graph and biological interpretation of data Biological concepts: free space, effect of increasing sample size, writing up scientific results	
24 RW	Ecological communities – definition Species interaction and community dynamics – introduction & symbols Higher diversity communities have higher productivity Higher diversity communities more resilient to disturbance; functional redundancy Intro to reinforcing effects: ecological engineers Keystone species and dominants – introduction Intermediate disturbance hypothesis Example: indigenous Aust & fire Succession and successional species Food chain theories: dynamic stability & energetic hypotheses	
25 RW	Revision	
Prac 7	Biodiversity in Brisbane's Creek catchments. Activities: create hypotheses, intro to large complex data sets, categorical and continuous variables, predictor and response variables, variable selection for hypotheses, field sampling techniques (line transects, soil sampling, weed ID, leaf litter invertebrate collection, canopy & ground cover estimates, canopy height estimates, photo points, GPS waypoints. Measures of urbanisation, berlise funnels. Biological Concepts: biodiversity in urban spaces	
26 CEF	*Challenge: water security and human health* All living things require water; except anhydrobiosis Water is sticky: adhesion, cohesion, surface tension Water transport in plants Water buffers temperature change; ocean currents, climate Chemical properties of water Distribution of Earth's water	
Volunteer opportunity	Volunteer opportunity for 32 students. Biodiversity in Brisbane Part 2 – collecting samples from field sites.	
27 CEF	Freshwater in Australia Global threatening factors to fresh water Human pop growth & water security; impact on other organisms Need to maintain biodiversity to secure fresh water The water cycle – intro and wetlands Water purification: process and organisms' roles Impacts on water quality from efforts to secure quantity of water (dams etc); hypoxia, barriers to movement, temperature, Case study: fish passageways	

28 CEF	Human pressures on rivers Case study: the Mary River no dam story Impact of river quality on organisms: Mary river turtle example (bimodal breathing) Lotic & lentic – definitions Impacts of hypoxia on diving in turtles	
Prac 8	Biodiversity in Brisbane Creek Catchments Part 3 Activities: students identify leaf litter insects collected from field samples and enter data into large spreadsheets.	
29 DOB	*Challenge: Coping with Disease* Genetic and phenotypic variability – intro Phenotypic variability comes from genes, their environment and their interactions P = G+E+GE Ultimate sources of variation; mutation & recombination & meiosis Types of mutations and their effects on fitness Evolutionary explanations: recombination increases genetic variability	
30 DOB	The evolutionary advantage of recombination; examples using scientific method Spatial hypothesis: new recombinants escape intraspecific competition Red Queen Hypothesis: frequency dependent selection Testing the hypotheses using NZ mud snail example (sexual and asexual pops)	
31 DOB	*Challenge: environmental change, invasions & climate change* How do genes contribute to phenotypic differences: G=VA+VD+VI Variance due to additive effects (intro) Variance due to interactions; epistatic effects of genes The environment alone can create differences between individuals: E=P-G H2 heritability R=SH2; response to selection Fundamental theorem of natural selection – intro	
Prac 9	Biodiversity in Brisbane Creek Catchments - Part 4 Activities: data analysis to test hypotheses, graphical display of data, biological interpretation of data, discussion about how to write discussions in a scientific paper.	
32 DOB	HE Heterozygosity – a general measure of genetic variability Population, inbreeding and mutation of important for heterozygosity and maintenance of a population Population size & genetic drift Inbreeding decreases He Natural selection is most efficient in large pops	
33 DOB	Organisms may respond to environmental change through dispersal by expanding distrib, contracting distrib, tracking or adapting (repeat content from LK) Example using scientific method: plants in USA with temp increases, when do they need to adapt? Will it be fast enough? R=SH2 Adaptation and evolution are not limited by lack of genetic variability Genetic constraint #1: lack of genetic variability on traits is important for adaptation Genetic constraint #2: fitness works in opposing directions in correlated traits Correlated traits – definition Traits correlated with fitness: what is it? Positive & negatively trait correlations	
34 DOB	Case study to put previous DOB lectures on context: Invasive species and the evolution of speed in cane toads More examples: seeds Spatial sorting - intro Assortative mating, R=DH2: intro	
Prac 10	Predicting the spread of an invasive species – the cane toad. Activities: set hypothesis, design experiment, collect and plot and interpret results, write short truncated report including hypothesis methods, results and discussion. Biological concepts: fundamental and realised niches, predictive models, locomotor performance and temperature, fitness	