

**UNIVERSITY OF ESWATINI**  
**2<sup>ND</sup> SEMESTER 2020/2021**  
**MAIN EXAMINATION PAPER**

**TITLE OF PAPER: SYSTEMATICS**

**COURSE CODE: BIO402**

**TIME ALLOWED: THREE (3) HOURS**

**INSTRUCTIONS: 1. ANSWER ANY FOUR (4) QUESTIONS**

**2. EACH QUESTION CARRIES 25 MARKS**

**SPECIAL REQUIREMENTS: NONE**

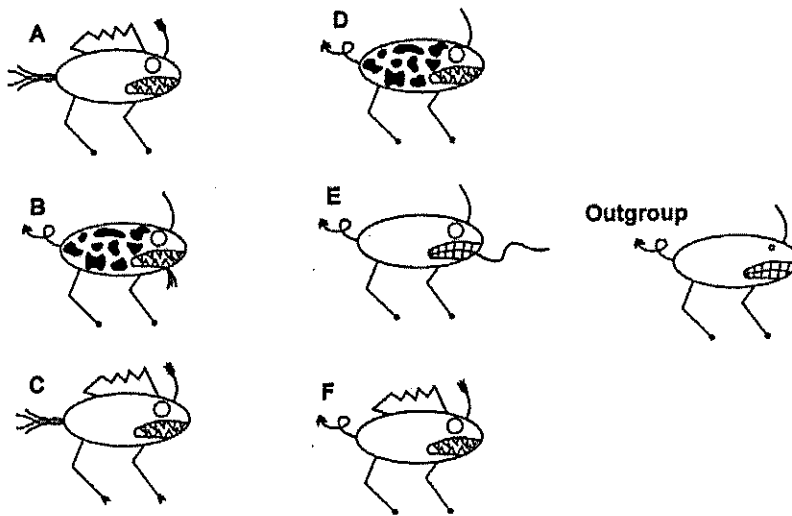
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**THE CHIEF INVIGILATOR**

**QUESTION 1**

- a) Name the two main ways to classify organisms and describe how they differ. (4 marks)
- b) Describe how systematics is of value to conservation biology. (2 marks)
- c) Name and define the four components of taxonomy. (6 marks)
- d) Suppose that two species, Q and R, have similar appearances but very divergent gene sequences, while species R and S have very different appearances but similar gene sequences. Which pair of species is more likely to be closely related: Q and R or R and S? Explain. (3 marks)
- e) Distinguish between orthologous and paralogous genes. Which of these two types of genes should be used to infer phylogeny? Explain your answer. (4 marks)
- f) Explain how numerous base changes could occur in an organism's DNA and yet have no effect on its fitness. (3 marks)
- g) Explain why phylogenies based on different genes can yield different branching patterns for the tree of life. (3 marks)

**Total: (25 marks)**

**QUESTION 2**



- a) Carefully examine the organisms (beasties) in the above picture and make a list of at least eight (8) characters, and their corresponding character states, that you might use to construct their phylogenetic tree. (8 marks)
- b) Construct the most parsimonious cladogram for the beasties and use bars and their corresponding character numbers to indicate the synapomorphies of each branch of the cladogram. (12 marks)
- c) Construct a dichotomous key for the identification of the beasties. (5 marks)

**Total: (25 marks)**

**QUESTION 3**

- a) Define reproductive isolation and explain its significance for speciation. (3 marks)
- b) Discuss the different forms of reproductive isolation, illustrating your answer with appropriate examples. (22 marks)
- Total: (25 marks)**

**QUESTION 4**

Discuss how any five of these attributes can be used as sources of taxonomic evidence: morphology, pollination biology, reproductive structures, anatomy, embryology, chromosomes and secondary metabolites. Use examples and/or diagrams (where appropriate) to illustrate your answer. (25 marks)

**Total: (25 marks)**

**QUESTION 5**

- a) Discuss the six principles of taxonomic nomenclature. (18 marks)
- b) Outline the requirements for a new species' name to be validly published. (7 marks)
- Total: (25 marks)**

**QUESTION 6**

Describe the process of preparing herbarium specimens starting from collecting in the field up to the point where the specimens are filed in a Herbarium cabinet. (25 marks)

**Total: (25 marks)**

**END OF EXAMINATION PAPER!**