BIOL 121 Section 123 2022T1
Evolution Group Midterm

Group Number from Canvas_____ Max Group Members = 6

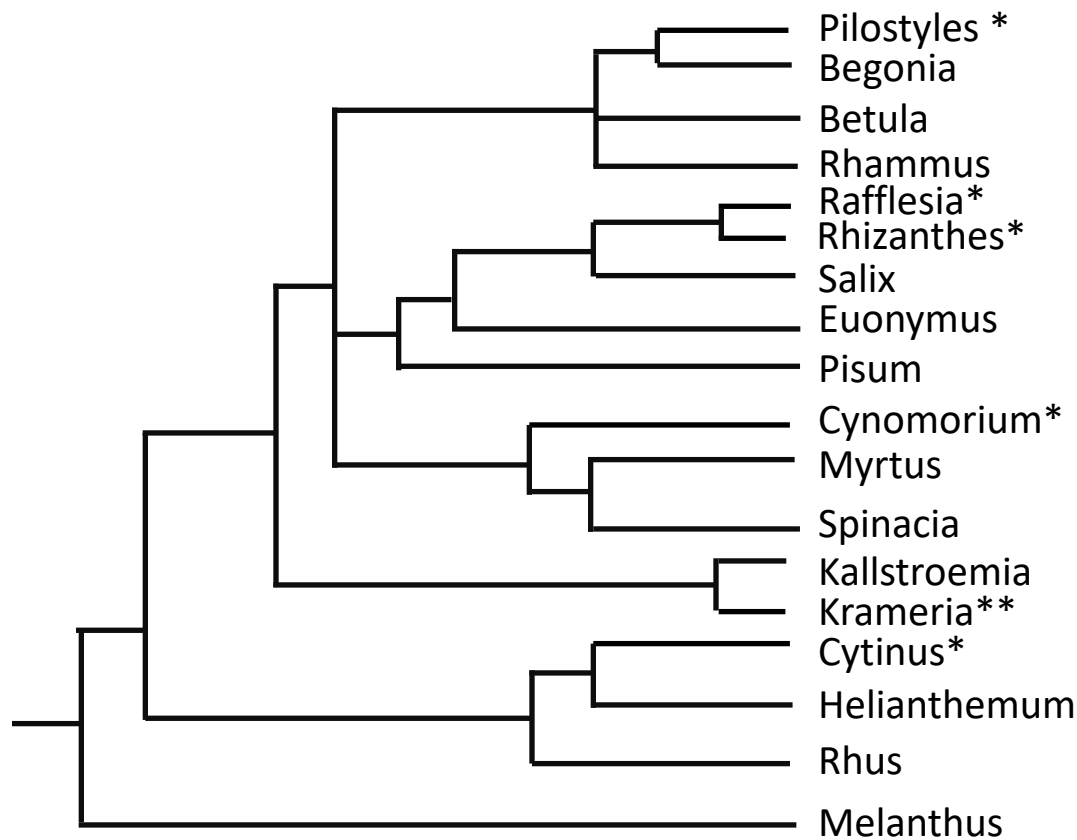| Name	Student Number
1)	
2)	
3)	
4)	
5)	
6)	

1) Don't take the test booklet apart.
2) Answer all questions in the space provided.
3) Writing can be in pencil or ink, but pencil, erasable ink or answers with white-out **cannot** be remarked.
4) Answers may be in sentences or point form. Illustrations are acceptable but must be annotated.
5) Students suspected of any of dishonest practices will be immediately dismissed from the examination and will be subject to disciplinary action.
6) Other than **a one-page** (double-sided) study sheet, no other memory devices are permitted. Study sheets that exceed the size limit may be confiscated and may be considered as cheating.
7) Students may speak with group members but not other groups.
8) Make sure you have 6 pages (3 pieces of paper) including this cover page.

Question	Value	Score
#1	16	
#2	9.5	
#3	14	
Total	39.5	

Question 1 – 16 Marks

1) There are a number of groups of plants that are parasitic on other plants. Some parasitic plants are obligately parasitic; they lack chlorophyll, don't produce sugars by photosynthesis and are completely dependent on another host plant for nutrition. Other parasitic plants are hemiparasitic (half-parasitic); they possess chlorophyll, produce sugars by photosynthesis and get some nutrition from another host plant. The phylogeny below shows the relationships among a large group of plants called the Rosids. Parasitic genera are indicated with a *, hemiparasitic genera are indicated with a **. In plants, once photosynthesis is lost, the trait is not regained.

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                                   ┌──── Pilostyles *
                              ┌────┤
                              │    └──── Begonia
                         ┌────┤
                         │    ├──── Betula
                         │    └──── Rhammus
                         │         ┌──── Rafflesia*
                         │    ┌────┤
                    ┌────┤    │    └──── Rhizanthes*
                    │    │ ┌──┤
                    │    │ │  └──── Salix
                    │    └─┤
                    │      │  ┌──── Euonymus
               ┌────┤      └──┤
               │    │         └──── Pisum
               │    │        ┌──── Cynomorium*
               │    │    ┌───┤
               │    └────┤   └──── Myrtus
               │         └──── Spinacia
          ┌────┤              ┌──── Kallstroemia
          │    │         ┌────┤
          │    └─────────┤    └──── Krameria**
     ─────┤              │    ┌──── Cytinus*
          │              └────┤
          │                   └──── Helianthemum
          │              └──── Rhus
          └──────────────────── Melanthus
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1a) What is (are) the most closely relate genus (genera) to Rhus (**2 marks**).

1b) On the phylogeny, circle a monophyletic group of your choice that contains more than one genus (**2 marks**).

1c) Briefly explain why the group you chose is monophyletic. (**2 marks**)

1d) What is the minimum number of times that parasitism has evolved in the Rosids? (**1 mark**)

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1e) On the phylogeny indicate where parasitism has evolved (**2 marks**).

1f) Are Euonymus, Salix and Rhizanthes transitional forms between Pisum and Rafflesia? Briefly explain your reasoning. (**2 marks**)

1g) In the Rosids, parasitism is (**1 mark**):

     a)   An analogous trait.
     b)   A homologous trait.
     c)   A vestigial trait.
     d)   Ancestral trait
     e)   Not possible to determine with the information provided.

1h) Provide a brief written justification to your answer to 1g explaining why you concluded that parasitism was an analogous, homologous, vestigial or ancestral trait. (**2 marks**)

1i) Was the ancestor of the Rosids parasitic? Briefly explain your reasoning. (**2 marks**)

Question 2 – 9.5 Marks

2a) List three specific characteristics that support the conclusion that all living organisms share a common ancestor. (**1.5 marks**)

2b) For the characteristics you listed in 2a, explain how they support the conclusion that all living organisms share a common ancestor. (**3 marks**)

2c) The figure from your text outlines the current understanding of the evolution of whales. Given the figure and your knowledge from class, explain how transitional forms are evidence that organisms have changed through time. (**5 marks**)
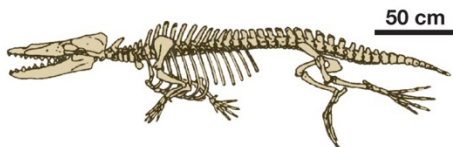
(b) Transitional forms during the evolution of whales

50 cm
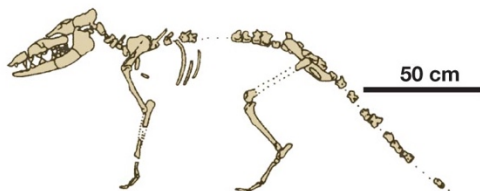
Pakicetus, about 50 myo

50 cm
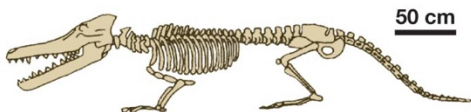
Ambulocetus, about 49 myo

50 cm

Rhodocetus, about 47 myo

50 cm

Basilosaurus, about 38 myo

Question 3 – 14 Marks

3a) You are studying a population of four o'clock flowers. You know from BIOL121 that flower color is determined by a single gene with 2 co-dominant alleles: AA individuals have purple flowers; Aa individuals have pink flowers; aa individuals have white flowers. Consider a population of 123 plants with the frequency of the A allele of 0.38. Fill in the table below for genotype frequencies and numbers of individuals. Report frequencies to two decimal places; numbers of individuals must be integers. You can use the next page for rough work. (**6 marks**)

Genotype	Expected frequency of genotypes if the population is in Hardy Weinberg Equilibrium	Expected Number of Individuals if the Population is in Hardy Weinberg Equilibrium	Possible Frequency of Individuals if the Population is NOT in Hardy Weinberg Equilibrium	Possible Number of Individuals if the Population is NOT in Hardy Weinberg Equilibrium
AA				
Aa				
aa				

3b) Studying the population you determine that bees visit plants with purple flowers more frequently than plants with pink or white flowers. Bees also tend to move from one purple flowered plant to another rather than between plants with different flower colors. You also measure the number of seeds produced by each plant; all plants regardless of flower color produce the same number of seeds on average and seeds have the same germination rate (i.e. the same proportion of seeds germinate). Would you expect this population to be in Hardy-Weinberg equilibrium? Briefly explain your reasoning with specific reference to all of the relevant assumptions of Hardy Weinberg equilibrium. (**4 marks**)

3c) Plants in the original population mated randomly, if you collected seeds from the plants and established 10 new populations of 75 individuals each, would you expect the frequencies of the A and a alleles in each of these populations to be the same as the original population or different? Explain your reasoning with specific reference to relevant evolutionary mechanisms. (**4 marks**)