To take full advantage of the practice midterm you should:

1. Review course material and make your summary notes and concept maps.
2. Print the exam. Pick a quiet place and give yourself 45 minutes to do the exam. Answer all the questions in the space provided.
3. Check your answers with the marking key provided.
4. Continue with your reviewing as necessary.
5. If you are unclear about material, go to the Learning Centre, post questions on the bulletin board, ask your group members, come to the review session.
6. Email me with questions or to set up an appointment if you are still unsure of something. Note: The last opportunity to meet with me before the midterm will be 4:30-5:30 Fri. Jan. 25. I will check my email at 11 p.m. Sun. Jan. 27 and will respond to any emails received before that time. I will not respond to emails again before the midterm.

Keep in mind that this is a practice midterm and the questions on your midterm will be similar in format and style, not necessarily in content.

UNIVERSITY OF BRITISH COLUMBIA

Biology 121

Section 225

Practice Midterm 1, Jan., 2013

Instructor: Dr. Carol Pollock

Name: _____ **Student number:** _____

Instructions:

1. Answer all questions in the space provided.
2. All writing must be in **INK**.
3. Answers may be in sentences or point form. Illustrations are acceptable but must be annotated.
4. Students suspected of any of dishonest practices will be immediately dismissed from the examination and will be subject to disciplinary action.
5. Other than **one side of one page** for summary notes and **one side of the same page for concept maps**, no other memory devices are permitted.
6. Students may not speak or in any other way communicate with other students while in the examination room.
7. Students may not expose their written paper to other students. The excuse of accidental exposure, forgetfulness, or ignorance will not be accepted.
8. Make sure you have **6** pages including this cover page.

I have read and fully understand these instructions.

Student signature _____

Mark allocation:

Question	Marks possible	Your mark
1.	10	
2.	8	
3.	8	
4.	4	
5.	8	
6.	9	
Total	47	
On exam bonus for notes	1	
On exam bonus for concept map	1	
Total	**47**	

1. (10 marks) Two species of shore crab, *Hemigrapsus nudus* (the purple shore crab) and *Hemigrapsus oregonensis* (the hairy shore crab) live in the intertidal region of the marine ecosystem. Both crab species are scavengers, consuming dead organic material, and both play a similar ecological role in the intertidal area of the marine ecosystem. In 1975 first-year Biology students did a survey of shore crab abundance as a function of substratum size (mean size of substratum particles as measured at their largest dimension). Their data are presented in the following figure, frame A. In 2005 another group of first-year students repeated the survey; their data are presented in frame B.

Hemigrapsus nudus ———— *Hemigrapsus oregonensis* ▬▬

Frame A: Frame B:

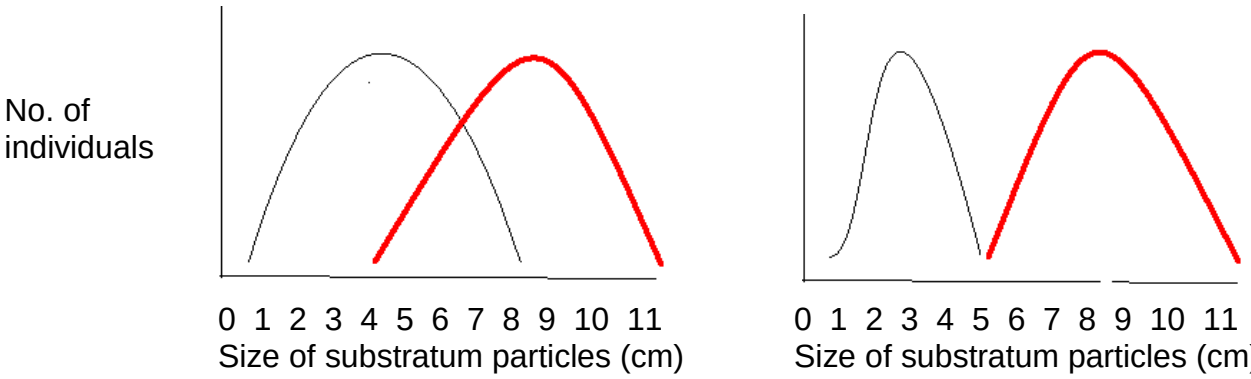

Fig. 1 the relative abundance of *H. nudus* and *H. oregonensis* as a function of substratum particle size at Tower Beach in 1975 (Frame A) and 2005 (Frame B).

a. Are the curves illustrated in the graph in **frame A** examples of the fundamental or realized niches of these organisms? Explain your answer. (2 marks)

b. What interaction (be specific) would you expect between the two species where their distribution overlaps in **frame A**? Why would you expect this interaction to occur? (3 marks)

c. Describe the effect of this interaction on the distribution of the two species in this area over 30 years between 1975 and 2005 (**frame B**). What is the name of this ecological process (be specific). (3 marks)

d. List one possible characteristic of *H. oregonensis* and *H, nudus* that could have led to the results observed and indicate how this characteristic could have led to the results observed. (2 marks)

2. (8 marks) Point Grey, where UBC is situated, has many paths down to the beach. One of these paths, Beach trail #3, leads to Tower Beach. The cliffs surrounding the beach are made of sand and are quite unstable. In Jan. 1935, 37 cm of rain and snow fell in the Lower Mainland over four days. The subsequent flooding washed 100,000 tonnes of material down one bank above Tower Beach, forming a gulley. All soil and vegetation were swept away down the gulley. In 1965 a survey of the vegetation in the disturbed area and the adjacent undisturbed area next to the gulley was completed. The following plant species were found at the two sites:

Species	Number at undisturbed site	Number at disturbed site
Sword fern	5	0
alder	3	50
Mature Douglas fir	15	0
Douglas fir seedling	5	5
salmonberry	8	2
Mnium (moss)	5	2
Maple	3	0
hemlock	5	5

a. Which site has the greatest species richness? (1 mark)

b. Which species is the most likely to be a pioneer species at the disturbed site? (1 mark)

c. List two features that are characteristic of a good pioneer species. (2 marks)

d. Compare the importance of abiotic and biotic factors in communities that are in earlier and later successional stages. Explain using examples from the data presented above. (4 marks)

3. (8 marks) Arnold and Danny are going out for sushi. Danny orders a cucumber roll (rice, seaweed and cucumber) and Arnold orders a tuna roll (rice, seaweed and tuna).

a. How many trophic levels are represented in each of the different sushi types? Explain. (5 marks)

b. Arnold and Danny each believe that their sushi is the healthier to eat. Who do you support – Danny (cucumber roll) or Arnold (tuna roll)? Use bioaccumulation and biomagnification to explain your answer. (3 marks)

4. (4 marks) You completed an online questionnaire to determine your Ecological Footprint (EF).

a. Based on your answers to this questionnaire what is one reasonable way you can reduce your EF? (1 mark)

b. Explain why, based on the calculation of the EF, this action will be effective in reducing your EF (3 marks).

5. (8 marks) You have a cell in G_1 of interphase with 6 chromosomes and 20 pg (picograms, 1 picogram = 1 x 10^{-12} g) of DNA.

a. Complete the following table for this cell: (6 marks)

Stage	No. of chromosomes	Amount of DNA/cell (pg)
G_1		
Beginning of S		
End of S		
G_2		
Prophase		
Beginning of metaphase		
Anaphase		

b. Cells such as neurons that are not going to ever divide are in a modified G_1 stage called G_0. Which cell cycle checkpoint, G_1/S, G_2/M or M, do you think is most important in converting a cell is to G_0? Explain. (2 marks)

6. (9 marks) When CO_2 is absorbed by the ocean it combines with water to produce carbonic acid. The increased acidity reduces the amount of dissolved calcium carbonate in ocean waters. Calcium carbonate is an important component of the shell of many marine species; a decrease in calcium carbonate can result in decreased survival of intertidal animals such as mussels. At the same time, eelgrass, which is tolerant of low pH conditions, has been increasing in intertidal areas. Dr. Chris Harley of the Zoology department at UBC is concerned because mussels in the intertidal region of Tower Beach are decreasing in numbers; however it is not clear what is causing the decrease in number: 1) decreased pH (from 5.5 in 2005 to 5.0 in 2011) impacting survival or 2) competition from eelgrass. You are hired as a summer student to work on this project. You are going to design an experiment to distinguish between the two possibilities listed above.

a. What are two hypotheses for this experiment? (2 marks)
Hypothesis 1:

Hypothesis 2:

b. Briefly describe an experiment you could do to investigate which of these hypotheses is supported. Assume you have access to tanks with a suitable substratum (rocks) and sufficient mussels, eelgrass, and two batches of ocean water, one with pH =5.5 and other with pH = 5.0. Draw a diagram if it helps with your explanation. (3 marks)

c. What predictions would you make if each of these hypotheses were supported? (2 marks)
Prediction if hypothesis 1 is supported:

Prediction if hypothesis 2 is supported:

d. If a combination of decrease in pH and competition are causing the decrease in numbers of mussels, how would that influence your results? (2 marks)