

G131: OCEANS & OUR GLOBAL ENVIRONMENT

Integrated Topics Group Activity

Fall 2015

Part B: Spatial Connections

Group: 1 ☐ 2 X 3 ☐ 4 ☐

(Replace the box for your group with this X)

Group Members:

(Please collate details of the group members and complete the listing below)

	Name	Login (email)
Student 1:	Kyle Nealy_____	knealy@indiana.edu_____
Student 2:	Claire Strohl_____	cestrohl@indiana.edu_____
Student 3:	Alex Brewers_____	_____
Student 4:	Tara Donahue_____	_____

The aim for the subgroup is to complete this worksheet by providing collective answers to each part of the task and submit a final version of this document (via Canvas upload) approved by all subgroup members.

Please upload your final subgroup document using the following filename: ITPtBSubgroupX-AFinal

(Replace the X in this filename with your group letter.

Both .doc and .pdf file types are acceptable for the final document.)

Tasks:

There is a single Task divided into two parts (40 points each part) to complete:

1. Recognize specific ocean phenomena that tend to co-occur and explain each correspondence.

Integrated Topics Part B: Spatial Connections

This task focuses on recognition that specific ocean phenomena are related and tend to co-occur in the ocean. It consists of two parts: (a) identifying four distinct sets of three oceanic characteristics that co-occur and suggest appropriate locations where each are found in the Pacific Ocean (see sites P1-10 designations in the accompanying map), (b & c) explain the rationale for two of these selections.

Guidelines:

The first task is to match three ocean phenomena that are spatially related and identify where they co-occur, entering answers in the table provided. For parts (b) and (c) of each question explain in ~30-50 words the relationship between the three characteristics and why they co-occur.

Strong answers will correctly match the series of characteristics in groups of three (without repetition of individual letters), justify both selections by explaining why such characteristics co-occur based on common controlling factors or direct relationships, and choose an appropriate a suitable location from the options (P1 – 10) in the map of the Pacific.

A1. Complete the table below by entering distinct combinations of three letter codes (A to N), one set in each of four rows, which correspond to specific oceanic characteristics that co-occur (5 points/row), and where they are found to co-occur in the Pacific Ocean (5 points/row).

- | | | | |
|-------|-------------------------------|----|---------------------------|
| a. A. | Carbonate sediments | H. | Hydrothermal vents |
| B. | Centers of ocean gyres | I. | Low plankton productivity |
| C. | Chemosynthetic bacteria | J. | Mid-ocean ridge |
| D. | Convergence of oceanic waters | K. | Nutrient-poor waters |
| E. | Corals | L. | Nutrient-rich waters |
| F. | Divergence of oceanic waters | M. | Upwelling waters |
| G. | High plankton productivity | N. | Warm ocean waters |

Important Note: Each letter can only be used *ONCE*.

No.	First Letter Code	Second Letter Code	Third Letter Code	Example Location of Co-occurrence in the Pacific Ocean (P1 – 10)
#1	H.	J.	C.	P5
#2	B.	K.	I.	P4
#3	F.	M.	L.	P7
#4	E.	N.	A.	P9

- b. Explain why the characteristics of one of your selections tend to co-occur. (20 points)

The characteristics of selection 1 tend to co-occur due to their dependence on one another's physical processes. Hydrothermal vents form at weak points in the earth's crust near volcanically active sites like hotspots or plate boundaries. Along these volcanically active sites, such as mid-ocean spreading ridges, water is heated by geothermal processes beneath the crust and pumped up through the 'vents'. The exceedingly hot water emitted from hydrothermal vents is saturated with heavy metals and various toxic chemicals that are fatal to most marine life. Although hydrothermal vents are inhabitable by most marine life, types of bacteria that utilize energy released from inorganic chemical reactions for

nourishment, known as Chemosynthetic bacteria, thrive in such environments. The bacteria are able to absorb hydrogen sulfide escaping from the vents and oxidize it to sulfur, using the energy created during oxidation for sustenance. The bacteria in turn provide nourishment to an entire ecosystem of grazing marine animals that feed on the bacteria. Thus, chemosynthetic bacteria tend to grow in thick orange and white mats over the rocks around hydrothermal vents, which tend to form within mid-ocean spreading ridges and other volcanically active sites.

- c. Explain why the characteristics of another of your selections tend to co-occur. (20 points)

The characteristics of selection 4 tend to co-occur because of the co-dependency exhibited by each of these features within an ecosystem. Coral reefs require warm, temperate waters to grow and thrive. Due to the unique biological and sedimentary nature of coral reef environments, the entire reef itself can actually be considered one large sedimentary rock. They also differ from most any other marine environment in that they produce most of their own sedimentary deposits. Usually, benthic marine environments collect sediments transported by numerous means from somewhere else, known as exogenous sediments. In coral reef environments, however, the reef itself endogenously produces over 90% of the accumulated sediment. The sediment is accumulated in excess, such that the surplus is carried throughout the reef and back into the ocean by currents. Erosion and natural processes form various carbonate sediments from the coral reefs. Since the source of the bulk of a reef's sediment is the reef itself, the sediments are almost entirely carbonate, such as aragonite and high-magnesium calcite. These three features tend to occur together because carbonate sediments form from coral reef environments, which require warm waters to grow.

