Shedding Light on the Sun and Earth Episode 5: Land and Ocean Name: _____

Part A

1. Uluru and Fraser Island are at the same latitude (about 25°S) but the temperatures they get throughout the year are quite different. Briefly describe how they are different on a daily basis and on a yearly basis. (You will describe why they are different later!)

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2. Describe how northern hemisphere winters are different to southern hemisphere winters.

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Part B

3. The air doesn't really absorb much light energy from the sun. How, then, does it heat up? _____

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4. (a) What happens to the average air temperature as your altitude gets higher and higher?

_____

(b) Why? _____
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Part C

5. _____ typically warms up more during the day than _____, even if the same amount of sunlight hits both of them. There are three main reasons for this…
6. Reason 1: Light can pass into water but it can't pass into sand and rocks etc. How does this affect the temperature that land and ocean reach during the day?_____

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7. Reason 2: When water _____, there is a cooling effect.
8. Reason 3: Water has a large _____ _____ _____.
9. If you heat equal masses of water and olive oil for an equal amount of time using the same heat source, how will their temperature rises be different? _____

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_____

10. What is the specific heat capacity of a substance? _____

_____
_____

11. Temperature is usually measured in _____ and energy is measured in _____ (given the symbol _____).
12. If exactly 1 kg of water increases in temperature by 1°C, it will have absorbed _____ joules of energy.
13. If exactly 1 kg of water increases in temperature by 2°C, it will have absorbed _____ joules of energy.
14. If exactly 1 kg of olive oil increases in temperature by 1°C, it will have absorbed _____ joules of energy.
15. The specific heat capacity of water is _____ while that of olive oil is _____.
16. The specific heat capacities of rocks, sand, and other earthen materials is about _____.
17. When the sun goes down, the land and the ocean stop being heated by the sun. How does water's large specific heat capacity affect the ocean's temperature drop at night compared to land's? _____

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Part D

18. Since _____ typically gets hotter than the _____ during the day, air blowing over _____ will typically get hotter than air blowing over the _____.
19. Generally, when it comes to coastal cities, winds blowing from the land towards the ocean are _____ while winds blowing from the ocean towards the land are _____. (warmer or cooler)
20. Why do inland regions typically reach higher temperatures during the day than coastal regions?

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21. Describe how a sea breeze forms. Diagram

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Part E

22. In Question 1, you described the daily and yearly temperature variations of Uluru and Fraser Island. How do account for these differences? _____

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23. Why does the northern hemisphere have (on average) colder winters compared to southern hemisphere winters?

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Part C Skill Builder

24. Write the formula that ties in the amount of energy absorbed by a substance, its specific heat capacity, its mass, and its temperature change.

_____

25. You pour 4 kilograms of water into a pot and begin heating it to make spaghetti. The temperature of the water starts at 20°C and finishes at 100°C (when it's boiling). How much energy does the water absorb as it is being heated? Show your working.

26. Fill in the table below that shows data about various substances being heated.

Substance	Specific Heat Capacity (J/kg/°C)	Mass of Substance (kg)	Initial Temperature (°C)	Final Temperature (°C)	Temperature Change (°C)	Energy Absorbed (= SHC × mass × temp change) (J)
water		1	20	21		
water		1	20	22		
water		1	20		10	
water		5	15	95		
olive oil		1	20	21		
olive oil		0.5	20	150		
granite	790	2	20	40		