

**B-Day: Due Thurs., Feb 25**  
**A-Day: Due Fri., Feb 26**

## 2009-10 Heat 2

- Conduction (I), Convection (II), or Radiation (III)?
  - \_\_\_ Your hand gets warm while underneath (but not touching) a hot pot of water.
  - \_\_\_ Your hand cools down when pushed against the metal on your desk.
  - \_\_\_ Why smoke rises above a campfire.
  - \_\_\_ Molecules bumping against each other.
- Does heat rise (*explain*)?

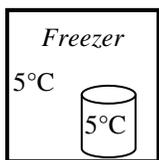
S 0 K	T 20 K	U 10 K
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V 40° C conductor	W 0° C conductor	X 40° C insulator
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- Use arrows to show which way heat will move between three objects above.
  - Which object/s lose heat?
  - Which object/s gain heat?
  - For which object/s will  $Q$  be negative?
  - For which object/s will  $Q$  be positive?
  - Which object has no internal energy?
- Use arrows to show the direction of heat flow.
  - Use two arrows to show if heat flows quickly and only 1 arrow if heat flows slowly.
  - Which object has no internal energy?
  - Will the final temperature be above 40° C?
  - Why?
- You put ice into a cup of hot chocolate. The ice gives its cold to the liquid. Yes or no and why?
- Convert 15°C to Kelvin.
  - Convert 80°F to Celsius.
- How much heat is necessary to raise 8 kg of water from 20°C to 40°C? ( $C_p$  is on the chart on the "Heat" notes.)
- How much heat is necessary to raise 8 kg of copper from 20°C to 40°C?
- Use Q7-8 above to answer the following:
  - Does it take more heat to raise the temperature of copper or water?
  - So, if the  $c_p$  of iron = 448 and  $c_p$  of aluminum = 899, which one will require the most  $Q$  to change its temperature?
- Which part of the desk feels colder: the metal or the wood?
  - Which one is actually colder: the metal or the wood?
  - Why do they feel different?
- Why did the colder of the two black squares melt the ice faster?
- Which has more internal energy?
  - \_\_\_ 2 atoms of super heated helium gas or 25 gallons of freezing water?
  - \_\_\_ Object H or Object I at the right?

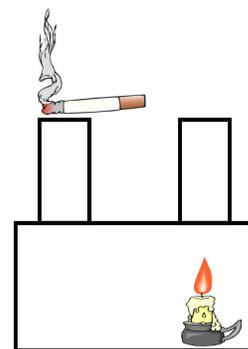
H: 500 kg iron at 10°C
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I: 200 kg iron at 10°C
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13. An object at 5°C is inside a freezer which is also at 5°C.  
Will heat go into or out of the object?

14. A. Draw what will happen to the smoke from the cigarette on the diagram.  
B. Explain why this occurs (be complete).



Two cans of water under heat lamps



15. A piece of metal and a piece of wood are placed into a hot oven.  
A. Which heats faster?  
B. When they are removed, which one will cool faster?  
(Things that heat faster, cool faster.)

16. Two identical cans of water are placed under identical heat lamps.  
A. Which can's water will raise its temperature fastest?  
B. If they are taken away from the lamp and begin at the same initial temperature, which can will cool fastest?

$c_{p\text{steam}} = 2010$ $Q = mc_{p\text{steam}}\Delta T$	steam	
	A	
$Q = mL_v$ $L_v = 2.26 \times 10^6$	B	100°C
		100°C
$Q = mc_{p\text{water}}\Delta T$ $c_{p\text{water}} = 4186$	Liquid	
	C	
$Q = mL_f$ $L_f = 3.33 \times 10^5$	D	0°C
		0°C
$Q = mc_{p\text{ice}}\Delta T$ $c_{p\text{ice}} = 2090$	ice	
	E	

Use the diagram at the left to answer the following.

17. Water at 35°C is raised to 105°C. (Mark these on the diagram.)

- What phase of matter does it start as?
- What phase of matter does it end as?
- How many equations would be necessary to calculate total heat (notice the equations at the left side of the diagram)?
- What is the top temperature for liquid water?
- What is the lowest temperature for gaseous water (steam)?
- For just the liquid portion, calculate how much heat is necessary to raise the water to its boiling point.

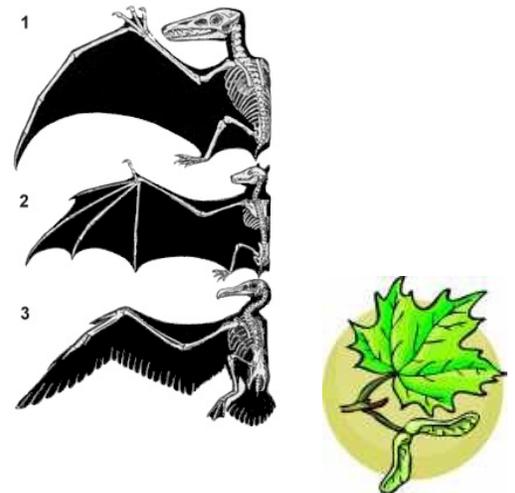
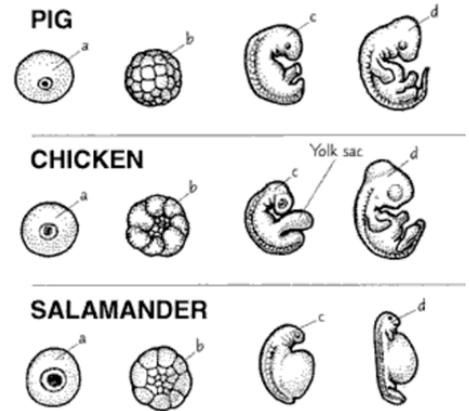
TAKS—next page

## Day 13—Theory of Biological Evolution

### Evidence of change in species:

- I. *Fossils: the fossil record shows gradual changes over millions of years.*
- II. *DNA sequences: some of our genetic code is the same as bacteria.*
- III. *Anatomical similarities: dogs and humans have same bone structures in their appendages (legs and arms).*
- IV. *Physiological similarities: even protistas have a “kidney-like” structures [helps get rid of water].*
- V. *Embryology: during gestation [in the egg or womb] organisms look similar – especially vertebrates.*

1. As an embryo grows is it undergoing mitosis or meiosis?
2. What is a fossil?
3. Physiology or anatomy?
  - A. \_\_\_ What parts are in an organism.
  - B. \_\_\_ How something functions (works).
  - C. \_\_\_ How the gills of a fish pull oxygen from water.
  - D. \_\_\_ Location of bones in an organism.
4. Which evidence for change in species (I—V above)?
  - A. \_\_\_ The pictures at the above right.
  - B. \_\_\_ Lung of animals and gills in fish are both for breathing.
  - C. \_\_\_ Bats and birds have the similar bones in their arms for flight.
  - D. \_\_\_ Apes and humans have 99% of the same DNA.
  - E. \_\_\_ Bones are found in deeper strata (layers) of rock that look similar.



### Illustrate results of natural selection:

- I. *Adaptation – genetic mutation of organisms as they adapt to their environment (animals that produce large amounts of young [some will survive]; needles on cacti).*
- II. *Behavior – about attracting a mate: many species of birds have complex dances; songs; nests in a certain way; longer plumes.*
- III. *Diversity – due to adaptations over great amounts of time, species become diverse within themselves (height; race) and result in many different species in an ecosystem.*
- IV. *Speciation – if enough adaptations occur, two organisms can be different enough to be a different species (can't mate and have fertile offspring). Can occur because of geographic or environmental separation (like continents separating).*
- V. *Phylogeny – over time we can see ancestry and which “branched off first”.*
- VI. *Extinction – sometimes organisms cannot adapt enough and disappear OR are too specialized. If the environment changes, they can't adapt back.*

5. Some seeds have wings that allow them to fly some distance. How does this help the plant?
6. When are two organisms defined as different species?
7. Which result of natural selection?
  - A. \_\_\_ One insect eats the pollen at the top of a plant and another eats the sap at the bottom.
  - B. \_\_\_ Male lions fighting each other for dominance.
  - C. \_\_\_ An organism community on a thermal vent in the ocean disappears when the vent goes dormant (stops).
  - D. \_\_\_ There are many different varieties of dogs.
  - E. \_\_\_ A moth becomes gray to blend in with soot from pollution.
8. Which organism is the ancestor of all of the other?
9. Which organism is most closely related to F?
10. How many adaptations is F from A?
11. Each adaptation comes from a mutation, which is a change in what?

