ANSWERS

Name

Period

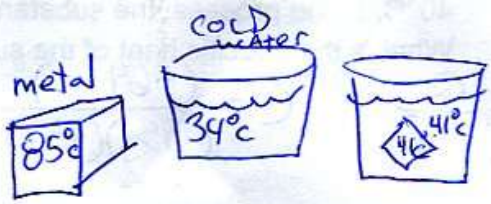
1. How much heat is released when 30 g of water at 96°C cools to 25°C? The specific heat of water is 1 cal/g°C.

$Q = m\ c\ \Delta T$

$Q = (30g)(1\frac{cal}{g°C})(71°C)$

$Q = 2130$ calories

2. Calculate answers to the questions:



How much heat entered the water?

$Q = m\ c\ \Delta T$

CAVEAT: only use water numbers

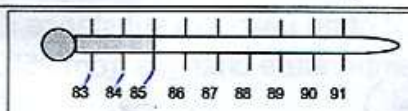
$Q = (18g)(4.18\frac{J}{g°C})(7°C)$

$Q = 500$ JOULES

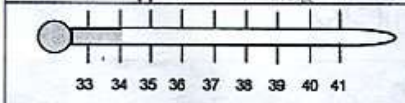
How much heat left the metal?

THE JOULES THAT ENTERED THE WATER ALL CAME FROM THE METAL!

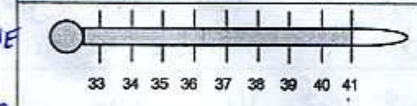
ANSWER: 500 joules



Temperature of the metal before it was dropped into the water..

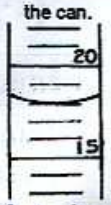


Water temperature before adding the metal.



Water temperature after adding the metal.

The water that was poured into the can.



18mL is 18grams

Finally, calculate what the specific heat of the metal. (assume the metal mass was 13.0 grams)

$Q = m\ C\ \Delta T$

$\frac{Q}{m\ \Delta T} = C$

$\frac{(500J)}{(13g)(44°C)} = C$

$0.9\frac{J}{g°C} = C$

For each item below indicate whether it applies to HEAT or TEMPERATURE

3. temperature Can be measured by inserting a thermometer
4. heat Can be measured by holding water nearby and then multiplying $mass_{water}$ x Cp_{water} x ΔT_{water}
5. temp one common unit for measuring this is degrees celsius
6. temp one common unit for measuring this is kelvins
7. heat one common unit for measuring this is joules

8. If a 3.1g ring made of unknown metal is heated using 10.0 calories, its temperature rises 17.9°C. Calculate the specific heat of the ring.

$C = \frac{Q}{m\Delta T}$

$C = \frac{(10.0\ calories)}{(3.1g)(17.9°C)}$

$C = 0.18\frac{cal}{g·°C}$

9. The temperature of a sample of water increases from 20°C to 46.6°C as it absorbs 5650 calories of heat. What is the mass of the sample? (Specific heat of water is 1.0 cal/g °C)

$\Delta T = 46.6 - 20 = 26.6°C$

$Q = m\,C\,\Delta T$

$m = \frac{Q}{C\Delta T}$

$m = \frac{(5650\,cal)}{(1.0\,\frac{cal}{g°C})(26.6°C)}$

$m = 210$ grams

10. A 155 g sample of an unknown substance was heated from 25°C to 40°C. In the process, the substance absorbed 569 calories of energy. What is the specific heat of the substance?

$C = \frac{Q}{m\Delta T}$ $\quad C = \frac{(569\,cal)}{(155g)(15°C)}$ $\quad C = 0.24\,\frac{cal}{g°C}$

11. What is the specific heat of an unknown substance if a 2.50 g sample releases 12 calories as its temperature changes from 25°C to 20°C?

$C = \frac{Q}{m\Delta T}$ $\quad C = \frac{(12\,cal)}{(2.50g)(5°C)}$ $\quad C = 0.96\,\frac{cal}{g°C}$

	Definition
12. Temperature	a measure of the average vibration speed of the particles
13. Heat	a measure of vibration and mass together

14. Calculate answers to the two questions:

How much heat (in joules) entered the water?

$Q = mC\Delta T$ ← USE ONLY WATER DATA

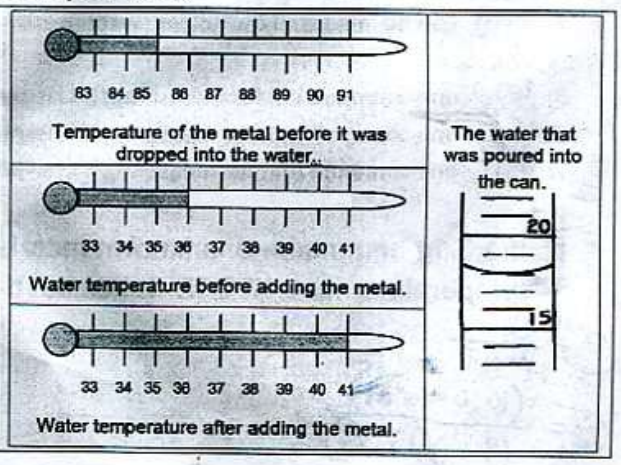
$Q = (18.0g)(4.18\,\frac{J}{g°C})(5°C)$

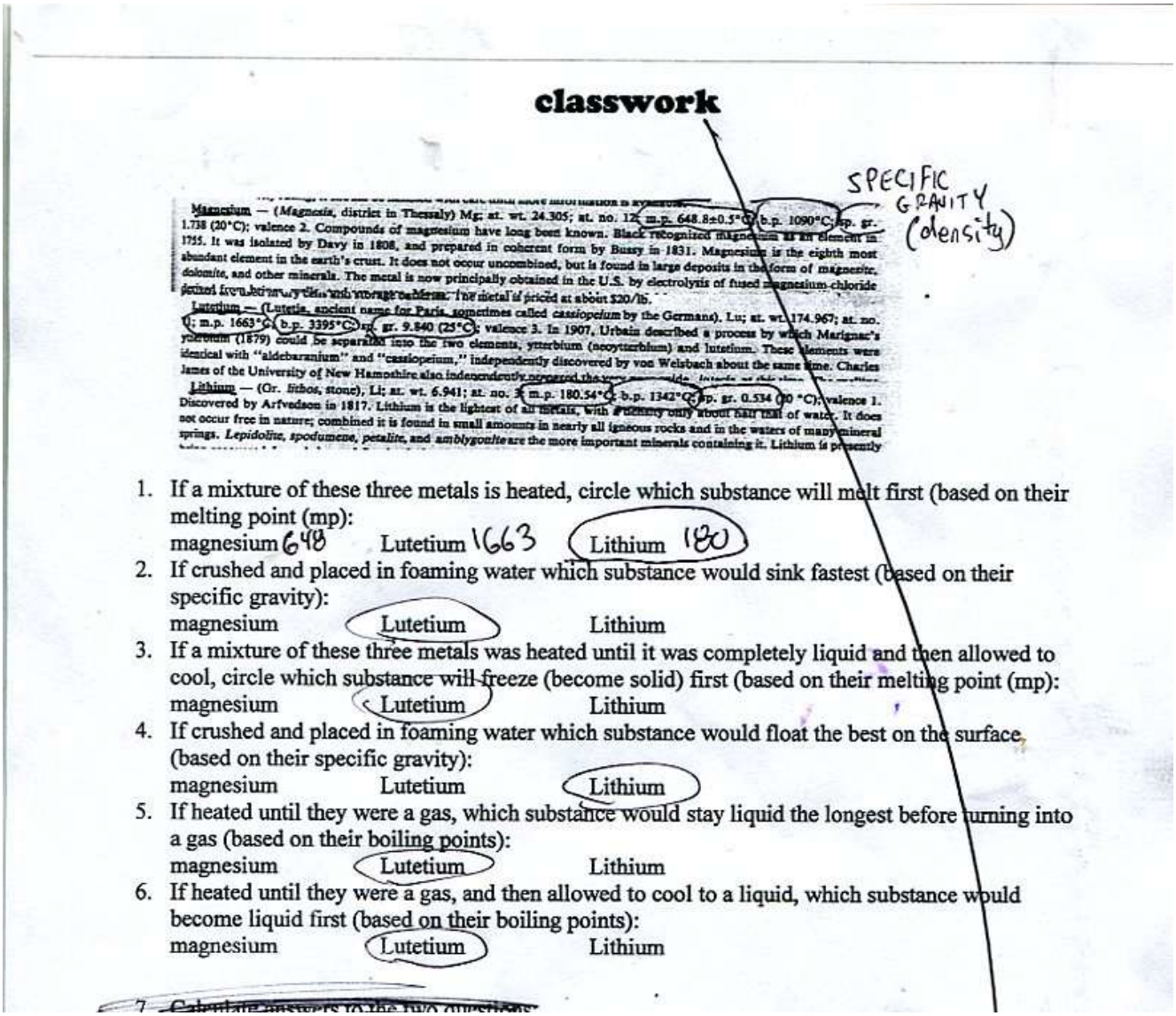
$Q = 376.2 \approx 380$ joules

How much heat left the metal?

Joules that left the metal were the same as joules that entered the water.

$Q = 380$ joules





classwork

SPECIFIC GRAVITY (density)

Magnesium — (*Magnesia*, district in Thessaly) Mg; at. wt. 24.305; at. no. 12; m.p. 648.8±0.5°C; b.p. 1090°C; sp. gr. 1.738 (20°C); valence 2. Compounds of magnesium have long been known. Black recognized magnesium as an element in 1755. It was isolated by Davy in 1808, and prepared in coherent form by Bussy in 1831. Magnesium is the eighth most abundant element in the earth's crust. It does not occur uncombined, but is found in large deposits in the form of magnesite, dolomite, and other minerals. The metal is now principally obtained in the U.S. by electrolysis of fused magnesium chloride derived from sea water and brines and wells. The metal is priced at about $20/lb.

Lutetium — (Lutetia, ancient name for Paris, sometimes called *cassiopeium* by the Germans). Lu; at. wt. 174.967; at. no. 71; m.p. 1663°C; b.p. 3395°C; sp. gr. 9.840 (25°C); valence 3. In 1907, Urbain described a process by which Marignac's ytterbium (1879) could be separated into the two elements, ytterbium (neoytterbium) and lutetium. These elements were identical with "aldebaranium" and "cassiopeium," independently discovered by von Welsbach about the same time. Charles James of the University of New Hamoshire also independently separated the two elements and this same year.

Lithium — (Gr. *lithos*, stone), Li; at. wt. 6.941; at. no. 3; m.p. 180.54°C; b.p. 1342°C; sp. gr. 0.534 (20 °C); valence 1. Discovered by Arfvedson in 1817. Lithium is the lightest of all metals, with a density only about half that of water. It does not occur free in nature; combined it is found in small amounts in nearly all igneous rocks and in the waters of many mineral springs. *Lepidolite*, *spodumene*, *petalite*, and *amblygonite* are the more important minerals containing it. Lithium is presently

1. If a mixture of these three metals is heated, circle which substance will melt first (based on their melting point (mp):
   magnesium 648 Lutetium 1663 Lithium 180
2. If crushed and placed in foaming water which substance would sink fastest (based on their specific gravity):
   magnesium Lutetium Lithium
3. If a mixture of these three metals was heated until it was completely liquid and then allowed to cool, circle which substance will freeze (become solid) first (based on their melting point (mp):
   magnesium Lutetium Lithium
4. If crushed and placed in foaming water which substance would float the best on the surface (based on their specific gravity):
   magnesium Lutetium Lithium
5. If heated until they were a gas, which substance would stay liquid the longest before turning into a gas (based on their boiling points):
   magnesium Lutetium Lithium
6. If heated until they were a gas, and then allowed to cool to a liquid, which substance would become liquid first (based on their boiling points):
   magnesium Lutetium Lithium

7. Calculate answers to the two questions

Quiz this Friday covers thingslearned through today

Purpose (this is the first thing you write in your notes after today's date):

How do we separate substances that are mixed?

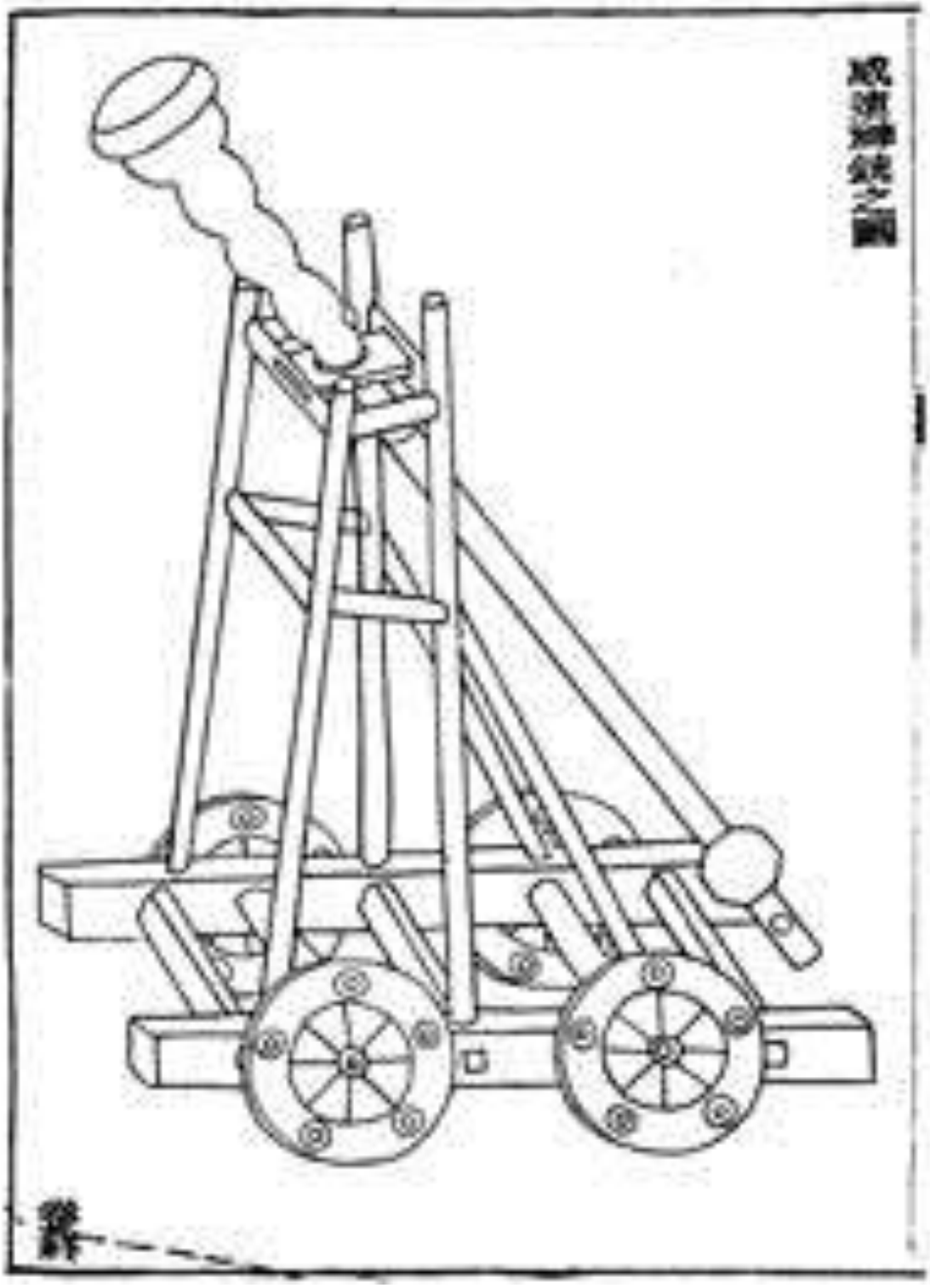
WARMUP (in your notes, copy and choose only one answer):

“I think that water is a (mixture / pure substance).”

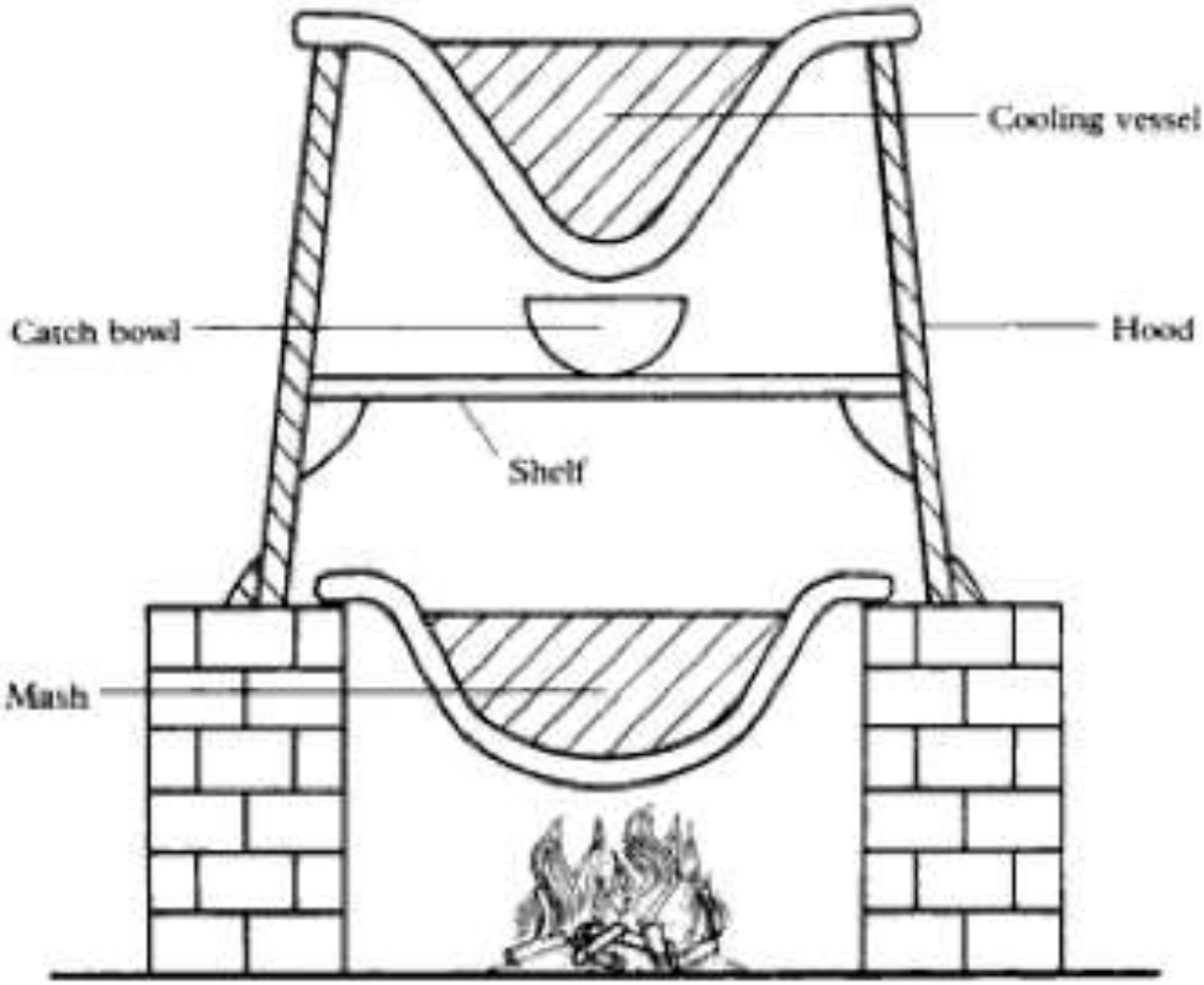
Homework Check:
Please take out your Tiger Sheet

TODAY’S AGENDA ***(you don’t need to copy this):***

1. *Homework check*
2. *Urine and Immortality*
3. *How to get Iron from a rock*
4. *Practice Worksheet*



塘漂竹斬


Cooling vessel
Catch bowl
Hood
Shelf
Mash

Substance (def'n) anything where all of the smallest grabbable particles are all the same.

All samples of a given substance will have the same properties (melt a the same temperature, have the same density, etc)

Mixture (defr'n) A mixture is any group of two or more substances.

Samples of mixtures have widely varying properties depending on the ingredients and their percentages. The properties of a mixture are a combination of the properties of its substances.

There are dozens of ways to separate a mixture into single substances. Here are a few:

a) Melting just one substance out from the mixture while solid, leaving the rest solid
b) Freezing just one substance out from the mixture while liquid
c) Evaporating just one substance at a time from the mixture
d) Trying to float the mixture in water
e) Trying to dissolve certain ingredients
f) Using a magnet
g) and many others…

Let’s practice applying this principal…