

\*The test will also ask you to identify different pieces of lab equipment!\*

Section 1 - Classifying Matter

- Explain the difference between a pure substance and a mixture:

element + compound (one type of particle) → many types of compounds

- Explain the difference between an element and a compound:

Element

→ one type of atom

compound

→ more than one type of atom that is attached to each other

- Explain the difference between a heterogeneous and homogeneous mixture:

Heterogeneous → when looking at it, you can see the difference in the different parts

homogeneous → when looking, cannot pick out individual parts

Examples: Determine whether each of the following is an element (E), compound (C), homogeneous mixture (HO), or heterogeneous mixture (HE):

- Oxygen gas ( $O_2$ ) E
- Saltwater HO
- Chicken noodle soup HE
- Carbon monoxide ( $CO$ ) C
- Stainless steel HO (steel is not an element so needs to be a mixture)
- 24k gold ( $Au$ ) E
- Brewed black coffee HO

Section 2 - Physical and Chemical Properties / Changes

- List as many physical properties as you can:

-size      - density      - color  
-shape      - mass      - melting / boiling point

- List as many chemical properties as you can:

~~transducibility~~  
- reacts with different substances

- What determines whether a change is chemical or physical?

Chemical → it has become new matter

physical → still the same type of matter

- List the four indicators of a chemical change:

- production of light
- production of heat
- production of gas
- change in color



Examples: Determine whether each of the following is a physical change (P) or chemical change (C):

- a. Water boils vigorously into vapor P
- b. Salt fully dissolves into water P
- c. A yellow precipitate is formed from two clear liquids C
- d. You get your hair cut P
- e. A tree is struck by lightning and gets burnt C
- f. A nail is left outside and rusts C
- g. Alcohol evaporates from an open bottle P

### Section 3 - Phase Diagrams

- Name the following phase changes:

- Liquid to solid: freezing      Solid to liquid: melting
- Liquid to gas: evaporating      Gas to liquid: condensation
- Gas to solid: deposition      Solid to gas: sublimation

- Which state of matter is present at low temperature and high pressure?

~~solid~~ solid (use a phase diagram to figure this out)

- Which state of matter is present at high temperature and low pressure?

gas

- Which state of matter is present at high temperature and high pressure?

liquid or gas

- How would you find the "normal" freezing, melting, or boiling point on a phase diagram?


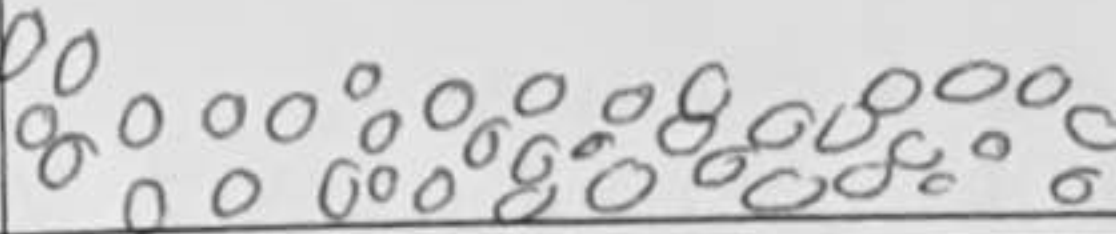
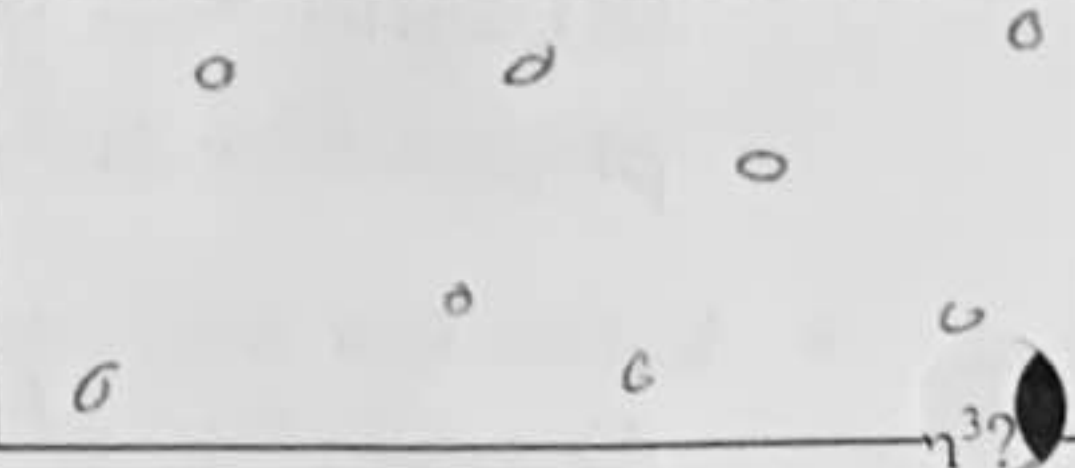
go to 1 atm and go over until you reach the line between solid + liquid for melting + freezing, or the line between liquid + gas for boiling + find the temp

- Explain the difference between the triple point and the critical point:

triple point → where all three states of matter are present

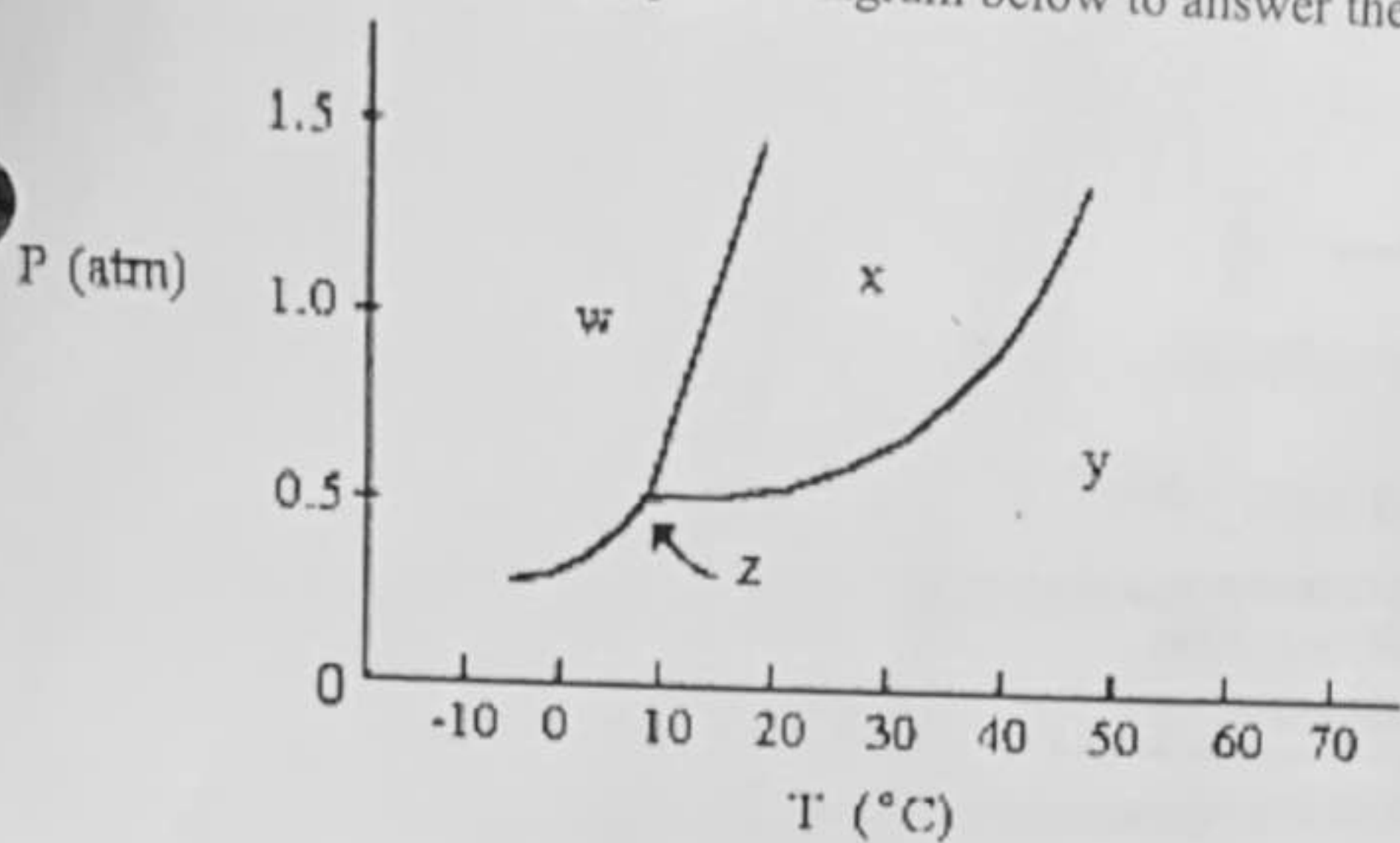
Critical point → where gas + liquid can no longer convert

- In the boxes, draw a diagram that represents what solid, liquid, and gas molecules look like

Solid	Liquid	Gas
		



Examples: Use the following phase diagram below to answer the questions that follow.

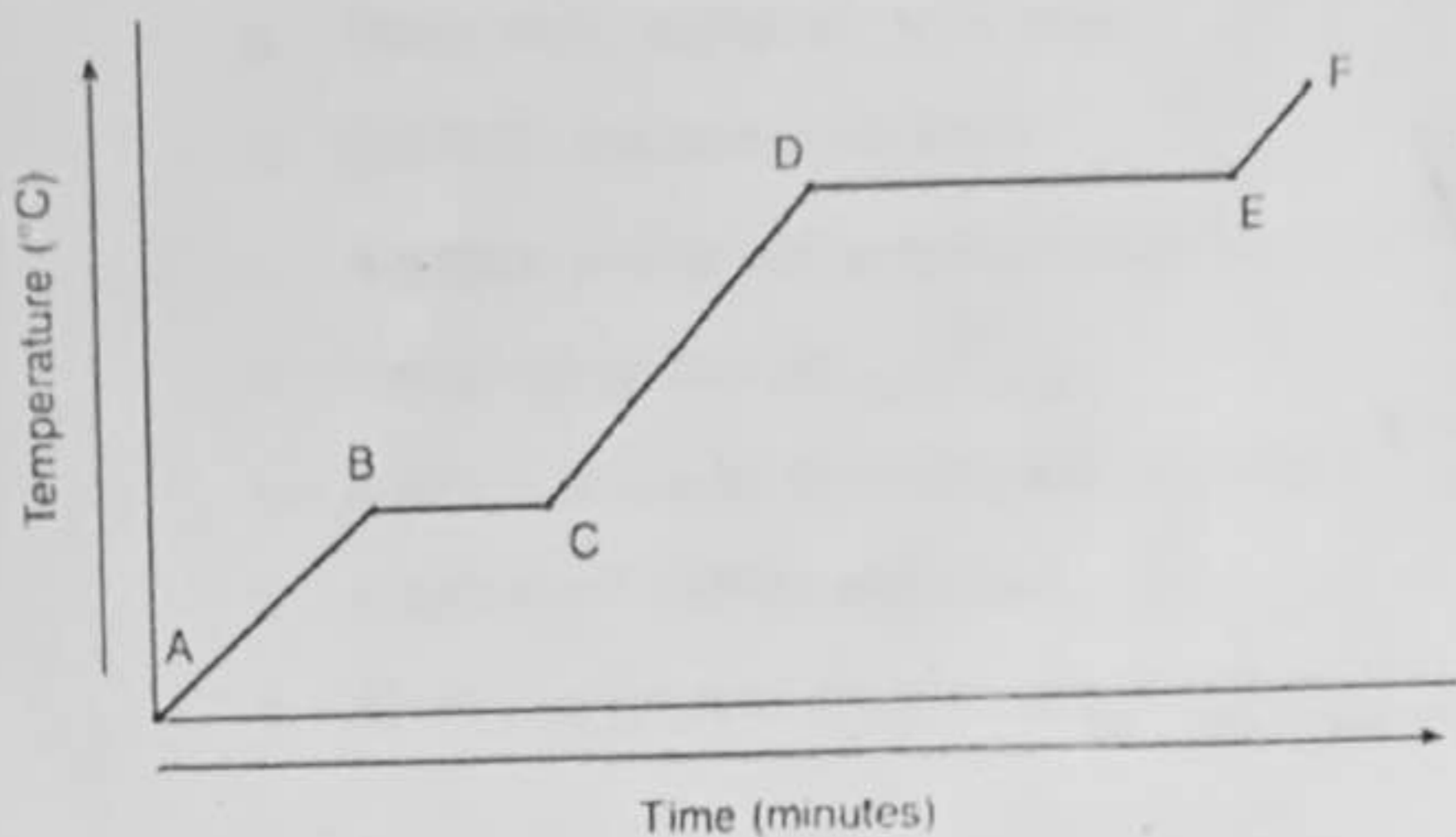


- What is the normal freezing point? 10°C
- What is the normal melting point? 10°C
- What is the normal boiling point? 40°C
- What state of matter is present in section W? S
- What state of matter is present in section X? l
- What is the name of the phase change that occurs when going from point X to Y? evaporation
- What state of matter is present at 40°C and a 0.5 atm? gas
- What is the name of point Z? triple point

#### Section 4 - Heating Curves

- What is represented by the plateaus on a heating curve (the flat lines)?  
phase changes
- What is represented by the diagonal regions of the heating curve?  
the states of matter
- If going from the top of the staircase to the bottom, is the process endothermic or exothermic?  
exothermic
- How can you determine the m.p., f.p., and b.p. from a heating curve?
  - melting + freezing are the temp at the first plateau
  - boiling point is the temp at the second plateau
- What are the axis labels for a heating curve? X: time Y: temp

Examples: Use the heating curve below to answer the following questions:



- What state(s) of matter are present between points A and B? S
- What state(s) of matter are present between points B and C? S + l
- What state(s) of matter are present between points C and D? l
- What state(s) of matter are present between points D and E? l + g
- What state(s) of matter are present between points E and F? g
- What is the melting point of this substance? 0°C (if water)
- What is the boiling point of this substance? 100°C (if water)
- Which phase changes are exothermic? condensation + freezing
- Which phase changes are endothermic? melting + boiling

### Section 5 - Density

- What is the formula for density?

$$D = \frac{m}{V}$$

- Rearrange the equation to solve for:

a. Mass:

b. Volume:

- What are the two different units that can be used for volume?

ml + cm<sup>3</sup>

- Perform the following density calculations:

- What is the density of a block with a mass of 200 grams and a volume of 100 cm<sup>3</sup>?

$$D = \frac{m}{V} = x = \frac{200g}{100cm^3} \quad x = \textcircled{2g/cm^3}$$

- What volume of soda do you have if you have 50 grams of a soda with a density of 2 g/mL?

$$D = \frac{m}{V} \quad x \cdot 2g/mL = \frac{50g}{x} \cdot x \quad 2x = 50 \quad x = \textcircled{25mL}$$

- What is the mass of a 30 cm<sup>3</sup> piece of aluminum? (Aluminum's density is 2.7 g/cm<sup>3</sup>).

$$30 \cdot 2.7g/cm^3 = \frac{x}{30cm^3} \cdot 30 \quad x = \textcircled{81g}$$

- What is the identity of an unknown metal with a mass of 33 grams and a volume of 19 cm<sup>3</sup>?

$$D = \frac{33g}{19cm^3} = \textcircled{1.7g/cm^3} \text{ Magnesium}$$