

NAME: KEY

PER: _____

MCAS QUESTIONS: PHASE CHANGES

- ① If 1 kg of the compound toluene melts at -95°C , then 500 g of toluene will
- A. melt at -47.5°C .
 - B. melt at -95°C .
 - C. boil at 95°C .
 - D. boil at 47.5°C .

EXPLAIN YOUR ANSWER: MELTING POINT (AS WELL AS BOILING, FREEZING, ETC)
IS INDEPENDENT OF MASS; THAT IS, ANY MASS OF
A SUBSTANCE WILL MELT (OR FREEZE, OR CONDENSE) AT
THE SAME TEMP. AS ANY OTHER MASS OF THAT SAME
SUBSTANCE

- ② In a laboratory, a sealed container with 100 g of steam is cooled until all the steam becomes a liquid. The container is then cooled further until all the water becomes a solid.

Which of the following remains constant during both of these changes?

- A. the mass of the water
- B. the pressure in the container \leftarrow CHANGES w/ TEMP CHANGE
- C. the total energy of the water \leftarrow CHANGES w/ TEMP CHANGE
- D. the position of the atoms in the container \leftarrow " "

EXPLAIN YOUR ANSWER: NO MASS IS LOST WHEN A SUBSTANCE CHANGES
STATE. THAT IS, NO ATOMS/MOLECULES ARE LOST (OR GAINED)
RATHER, THE ATOMS/MOL'S ARRANGE THEMSELVES DIFFER-
ENTLY. IN THIS CASE, THE STEAM MOLECULES MOVE
CLOSER TOGETHER (= CONDENSE) TO FORM LIQUID,
THE SAME # OF THEM REMAINS, MEANING MASS IS CON-

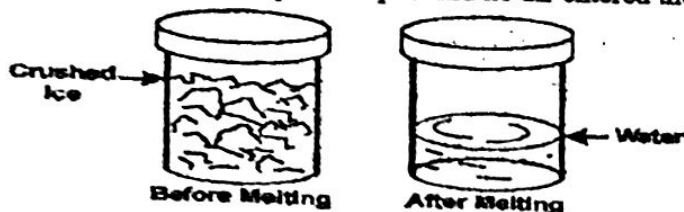
- ③ Which statement about the molecules in ice and the molecules in liquid water is correct?
- A. The molecules in ice have more energy than the molecules in liquid water.
 - B. The molecules in ice contain different atoms than the molecules in liquid water.
 - C. The molecules in ice have more electric charge than the molecules in liquid water.
 - D. The molecules in ice are less free to move than the molecules in liquid water.

EXPLAIN YOUR ANSWER:

ICE = SOLID = a) LOWER "E" atoms

b) fixed location of atoms w/
respect to each other -
hence definite size & shape

- 4) A can was filled with crushed ice, sealed, and massed. The ice was melted by slowly warming the can and contents. No water vapor escaped and no air entered the can.



If the can is then massed again, what is the best prediction of the mass?

- A. The mass would be the same.
B. The mass would be more.
C. The mass would be less.
D. It is impossible to predict without more information.

EXPLAIN YOUR ANSWER: a) SEE # 2 b) KEY POINT: CAN IS SEaled.
IF IT WASN'T, THEN H₂O VAPOR WOULD
ESCAPE, AND MASS WOULD BE LESS.

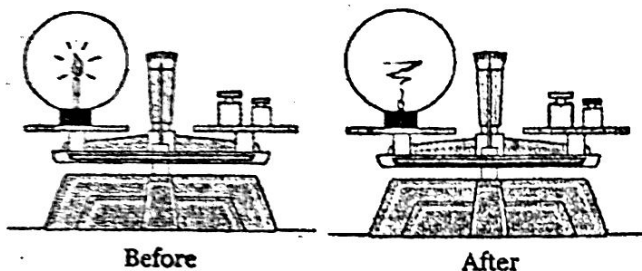
- 5) A container is filled with 100 mL of water and placed in a freezer. The water in the container freezes at 0°C. A second container filled with 90 mL of water is placed in a second freezer. At what temperature does this second container of water freeze?

- A. -10°C
B. -1°C
C. 0°C
D. 10°C

EXPLAIN YOUR ANSWER - FREEZING POINT IS CONSTANT - DOES NOT
DEPEND ON MASS OF SAMPLE - ANY MASS
OF H₂O WILL FREEZE @ 0°C* (*AVG. TEMP.)

A.

6. The diagram below shows a balance being used to measure a burning candle in a sealed glass ball before and after the burning is complete.



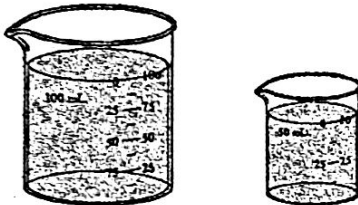
* KEY TO THE QUES.

As the candle burns, the size of the candle decreases the reading on the balance does not change. Which of the following is demonstrated by this experiment?

- A. The total mass of the system is constant.
- B. Energy is converted to mass when the candle is burned.
- C. Smoke particles have more mass than molecules of candle wax.
- D. Kinetic energy is converted to potential energy when the candle is burned.

BECAUSE BALL IS SEALED, NO MASS ESCAPES (SMOKE PARTICLE)
NO ATOMS LOST/GAINED IN THE PROCESS OF MELTING -
THEY JUST CHANGE THEIR POSITION (NO LONGER FIXED) &
DENSITY (SEPARATE FROM EACH OTHER, SO DENSITY DECR.)
NO CHANGE IN # ATOMS = CONSTANT MASS - IF CHANGES OF
STATE IN A CLOSED SYSTEM DO NOT CAUSE MASS CHANGES.

7. The two beakers below contain pure water.



Which of the following properties is the same for both of these samples?

- A. mass
- B. weight
- C. volume
- D. boiling point

SEE # 8
NOT (A) - DIFF VOLUME OF SAME SUBSTANCE = DIFF WEIGHT/MASS
NOT (B) - SEE # 1
NOT (C) - 100 ML, 50 ML DIFF. VOLUMES