Question 1

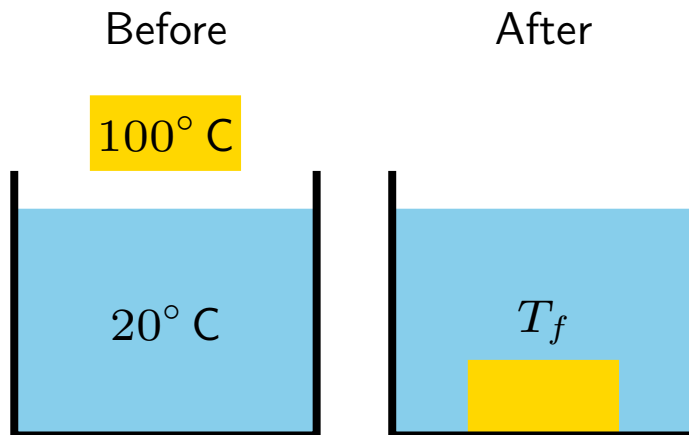A $10\,\text{kg}$ block of gold, initially at $100^\circ\,\text{C}$ is immersed into $1\,\text{kg}$ of water initially at $20^\circ\,\text{C}$. The specific heat of water is $4190\,\text{J/kgK}$ and gold $129\,\text{J/kgK}$.

Before · After

100° C

20° C

T_f

Which of the following is true regarding the final temperature of the mixture?

1. $T_f \geqslant 60^\circ\,\text{C}$

2. $T_f = 60^\circ\,\text{C}$

3. $T_f \leqslant 60^\circ\,\text{C}$

Question 2

Two identical ideal gases each initially have the same pressure and volume. They are heated to the same higher temperature. However, gas A is heated at constant pressure and gas B at constant volume.

Which of the following is true?

1. $Q_A = Q_B$

2. $Q_A > Q_B$

3. $Q_A < Q_B$

4. More information is needed.

Question 3

A balloon contains Helium gas at a fixed temperature. The pressure of the Helium is doubled in such a way that the temperature stays constant.

Which of the following is true regarding the mean free path of the Helium.

1. It stays the same.

2. It doubles.

3. It halves.

4. It increases but by less than a factor of two.

5. It decreases but by less than a factor of one half.