

1. The specific latent heat of vaporization of a substance is the quantity of energy required to
- A. raise the temperature of a unit mass of a substance by one degree Celsius.
 - B. convert a unit mass of liquid to vapour at constant temperature and pressure.
 - C. convert a unit mass of solid to vapour at constant temperature and pressure.
 - D. convert a unit mass of liquid to vapour at a temperature of 100 °C and a pressure of one atmosphere.

(1)

2. When a gas in a cylinder is compressed at constant temperature by a piston, the pressure of the gas increases. Consider the following three statements.

- I. The rate at which the molecules collide with the piston increases.
- II. The average speed of the molecules increases.
- III. The molecules collide with each other more often.

Which statement(s) correctly explain the increase in pressure?

- A. I only
- B. II only
- C. I and II only
- D. I and III only

(1)

3. Two different objects are in thermal contact with one another. The objects are at different temperatures. The temperatures of the two objects determine

- A. the process by which thermal energy is transferred.
- B. the heat capacity of each object.
- C. the direction of transfer of thermal energy between the objects.
- D. the amount of internal energy in each object.

(1)

4. A container holds 20 g of neon (mass number 20) and also 8 g of helium (mass number 4).

What is the ratio $\frac{\text{number of atoms of neon}}{\text{number of atoms of helium}}$?

- A. 0.4
- B. 0.5
- C. 2.0
- D. 2.5

(1)

5. Two identical boxes X and Y each contain an ideal gas.

Box X
n moles
temperature T
pressure P_X

Box Y
$2n$ moles
temperature $\frac{T}{3}$
pressure P_Y

In box X there are n moles of the gas at temperature T and pressure P_X . In box Y there are $2n$ moles of the gas at temperature $\frac{T}{3}$ and pressure P_Y .

The ratio $\frac{P_X}{P_Y}$ is

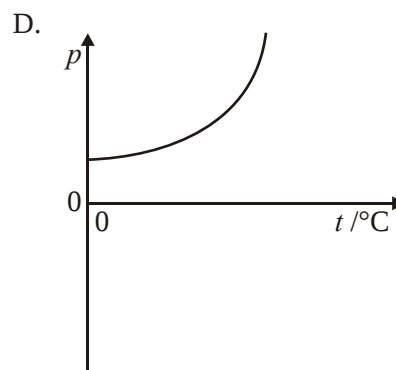
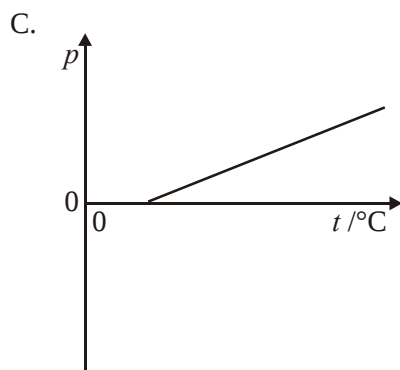
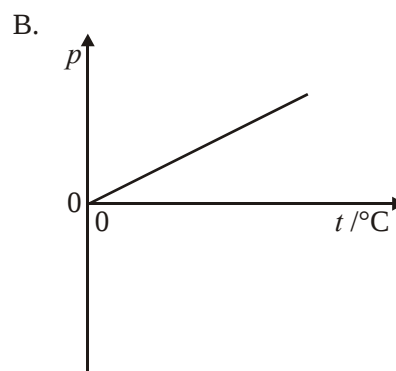
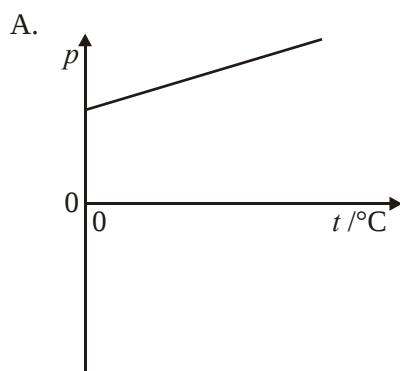
- A. $\frac{2}{3}$.
- B. $\frac{3}{2}$.
- C. 2.
- D. 3.

(1)

6. The specific latent heat of fusion of a substance is defined as the amount of thermal energy required to change the phase of
- A. the substance at constant temperature.
 - B. unit mass of the substance to liquid at constant temperature.
 - C. unit mass of the substance at constant temperature.
 - D. the substance to gas at constant temperature.

(1)

7. A fixed mass of an ideal gas is heated at constant volume. Which **one** of the following graphs best shows the variation with Celsius temperature t with pressure p of the gas?



(1)

8. Some liquid is contained in a shallow dish that is open to the atmosphere. The rate of evaporation of the liquid does **not** depend on

- A. the temperature of the liquid.
- B. the temperature of the atmosphere.
- C. the depth of the liquid.
- D. the pressure of the atmosphere.

(1)

9. The equation of state for an ideal gas, $pV = nRT$, describes the behaviour of real gases

- A. only at low pressures and large volumes.
- B. only at high temperatures.
- C. only at large volumes and large pressures.
- D. at all pressures and volumes.

(1)

10. The temperature of an ideal gas is reduced. Which **one** of the following statements is true?

- A. The molecules collide with the walls of the container less frequently.
- B. The molecules collide with each other more frequently.
- C. The time of contact between the molecules and the wall is reduced.
- D. The time of contact between molecules is increased.

(1)

11. A temperature scale is to be constructed using the property X of a substance. Which of the following must be a characteristic of the property X?

- A. The value of the property must be zero at zero kelvin.
- B. The property must increase with increase of temperature.
- C. The property must have a different value at each temperature to be measured.
- D. The value of the property must vary linearly with kelvin temperature.

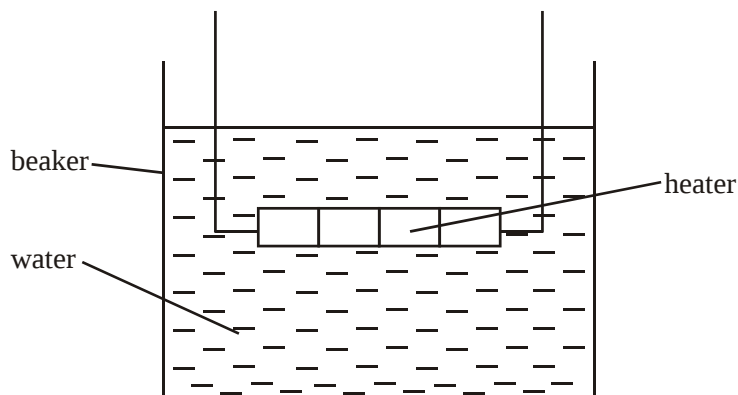
(1)

12. Which of the following is **not** an assumption on which the kinetic model of an ideal gas is based?

- A. All molecules behave as if they are perfectly elastic spheres.
- B. The mean-square speed of the molecules is proportional to the kelvin temperature.
- C. Unless in contact, the forces between molecules are negligible.
- D. The molecules are in continuous random motion.

(1)

13. As part of an experiment to determine the latent heat of vaporisation of water, a student boils some water in a beaker using an electric heater as shown below.



The student notes two sources of error.

Error 1: thermal energy is lost from the sides of the beaker

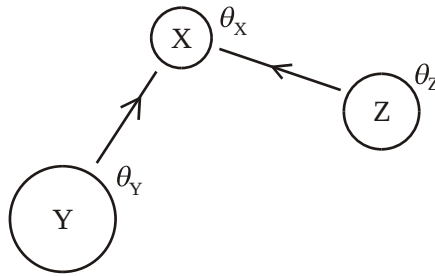
Error 2: as the water is boiling, water splashes out of the beaker

Which of the following gives the correct effect of these two errors on the calculated value for the specific latent heat?

	Error 1	Error 2
A.	Increase	Decrease
B.	Increase	No change
C.	Decrease	Increase
D.	Decrease	No change

(1)

14. Three bodies X, Y and Z are at temperatures θ_X , θ_Y and θ_Z respectively. Thermal energy passes freely from Y to X and also from Z to X, as illustrated below.



The direction of flow of thermal energy, if any, between Y and Z is unknown. What can be deduced about the temperatures θ_X , θ_Y and θ_Z ?

- A. $\theta_X = (\theta_Y + \theta_Z)$
- B. $\theta_Y = \theta_Z$
- C. $\theta_Y > \theta_X$
- D. $\theta_X > \theta_Z$

(1)

15. The equation of state of an ideal gas is

$$pV = nRT.$$

In this equation, the constant n is the number of

- A. atoms in the gas.
- B. molecules in the gas.
- C. particles in the gas.
- D. moles of the gas.

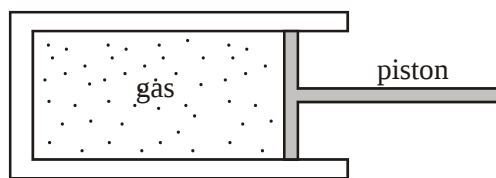
(1)

16. The specific latent heat of vaporisation of a substance is defined as the amount of thermal energy required to

- A. change a liquid to vapour at constant pressure.
- B. change a liquid to vapour at constant temperature.
- C. change unit mass of liquid to vapour at constant pressure.
- D. change unit mass of liquid to vapour at constant temperature.

(1)

17. A gas is contained in a cylinder fitted with a piston as shown below.



When the gas is compressed rapidly by the piston its temperature rises **because** the molecules of the gas

- A. are squeezed closer together.
- B. collide with each other more frequently.
- C. collide with the walls of the container more frequently.
- D. gain energy from the moving piston.

(1)