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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  $100^{\circ}\text{C}$  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.
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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.

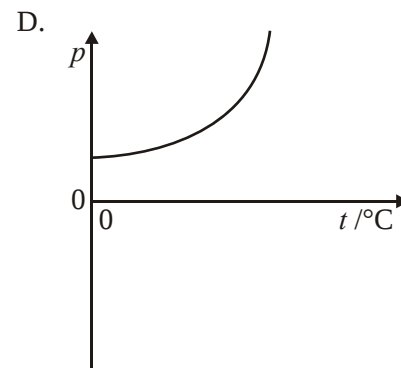
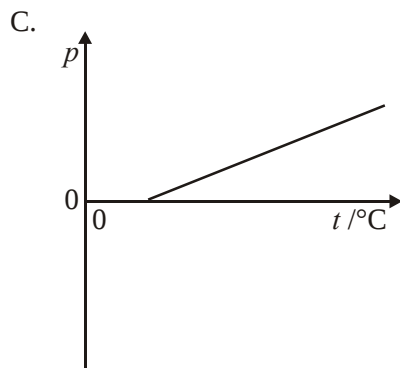
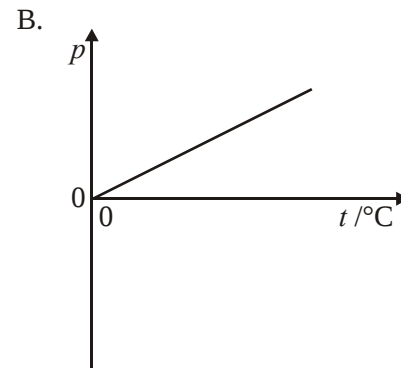
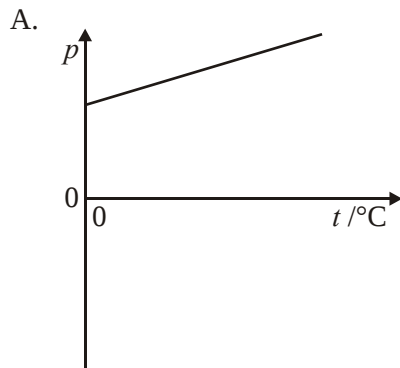
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6. The specific latent heat of fusion of a substance is defined as the amount of thermal energy required to change the phase of
- A. the substance at constant temperature.
  - B. unit mass of the substance to liquid at constant temperature.
  - C.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



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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)

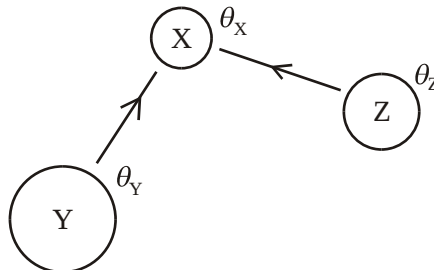
9. The equation of state for an ideal gas,  $pV = nRT$ , describes the behaviour of real gases
- A. only at low pressures and large volumes.
  - B. only at high temperatures.
  - C. only at large volumes and large pressures.
  - D. at all pressures and volumes.

(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. Three bodies X, Y and Z are at temperatures  $\theta_X$ ,  $\theta_Y$  and  $\theta_Z$  respectively. Thermal energy passes freely from Y to X and also from Z to X, as illustrated below.



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The direction of flow of thermal energy, if any, between Y and Z is unknown. What can be deduced about the temperatures  $\theta_X$ ,  $\theta_Y$  and  $\theta_Z$ ?

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

(1)

12. 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.

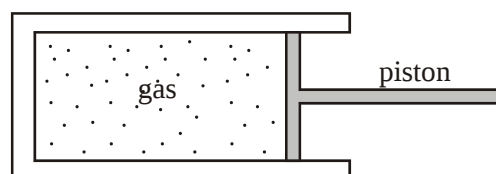
(1)

13. 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)

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



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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)