

SECTION B: THERMAL PHYSICS

MULTIPLE CHOICE REVIEW

1. Which of the following scientists provided the evidence which led to the abandoning of the caloric theory of heat?
 - I. Newton
 - II. Boyle
 - III. Rumford

(A) III only
(B) II only
(C) I and III only
(D) II and III only
2. Which of the following is the MOST suitable range for a clinical thermometer?

(A) 0°C to 44°C
(B) -10°C to 110°C
(C) 35°C to 100°C
(D) 35°C to 44°C
3. In a thermocouple thermometer, which thermometric property is used?

(A) Variation of electrical resistance
(B) Expansion of metals
(C) Emission of electrons from a hot metal surface
(D) Production of a current at the junction of unlike metals
4. Which of the following is correct?

(A) $T/K = \theta/^{\circ}\text{C} = 273$
(B) $T/K = \theta/^{\circ}\text{C} + 273$
(C) $T/K = 273 - \theta/^{\circ}\text{C}$
(D) $273 - T/K = \theta/^{\circ}\text{C}$
5. There are NO attractive forces between the molecules in a

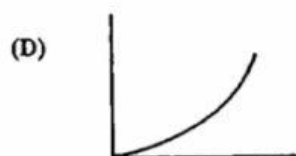
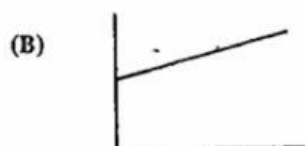
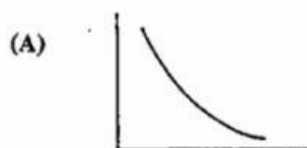
(A) liquid and gas
(B) solid and a liquid
(C) liquid
(D) gas
6. A gas is much easier to compress than a solid or liquid because the gas molecules

(A) are very numerous
(B) are arranged randomly
(C) are moving very rapidly
(D) have no forces between them
7. When a gas is heated in a closed container at a constant volume, the pressure of the gas rises. Which of the following statements concerning this fact is/are TRUE?
 - I. The pressure rises because the gas molecules strike the walls of the container with greater momentum.
 - II. The pressure rises because the gas molecules now collide with the walls of the container more frequently.
 - III. The pressure rises because the forces between the gas molecules are larger at higher temperatures.

(A) I only
(B) I and II only
(C) II and III only
(D) I, II and III
8. A glass bulb is filled with a gas at a temperature of 293 K . If the initial pressure of the gas is P , what will it be when the temperature increases to 360 K ?

(A) $\frac{293}{360} \times P$
(B) $\frac{360}{293} \times P$
(C) $\frac{293}{360} \times \frac{1}{P}$
(D) $\frac{360}{293} \times \frac{1}{P}$

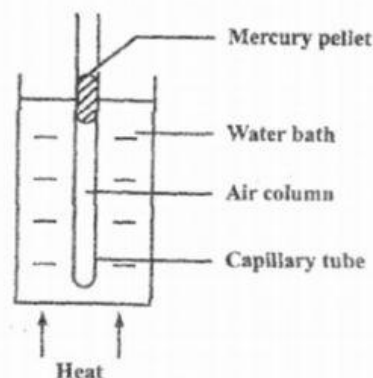
9. Which of the following graphs is obtained if the volume of a fixed mass of gas, at a constant pressure, is plotted against its Kelvin temperature?



10. A flask contains air under pressure. Some of the air is let out slowly over a period of 10 s. When the flask is closed the

- (A) pressure of the air in the flask will have increased
 (B) volume of air in the flask will have decreased
 (C) temperature in the flask will have increased
 (D) number of molecules striking the wall per second will have decreased

11.



The diagram above shows an air column trapped in a capillary tube by a mercury pellet. When the temperature of the water bath is raised, what happens to the volume and pressure of the trapped air?

- (A) Volume increases, pressure remains constant.
 (B) Volume increases, pressure increases.
 (C) Volume remains constant, pressure remains constant.
 (D) Volume remains constant, pressure increases.

12. Boyle's law for a gas can be tested experimentally, provided which of the following is/are maintained constant?

- I. Temperature
 II. Pressure
 III. Density
 IV. Mass

- (A) III only
 (B) I and II only
 (C) I and IV only
 (D) I, II and III only

13. Which of the following would be the unit of the heat capacity of an object?

- (A) J
 (B) J kg^{-1}
 (C) J K^{-1}
 (D) $\text{J kg}^{-1} \text{K}^{-1}$

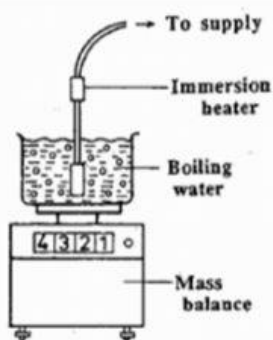
14. The specific heat capacity of a material is the energy required to

- (A) melt 1 kg of the material with no change of temperature
- (B) change the temperature of the material by 1 K
- (C) change 1 kg of the liquid material to 1 kg of gas without a change in temperature
- (D) change the temperature of 1 kg of the material by 1 K

15. The specific latent heat of vaporization of water is the energy required to change 1 kg of water at

- (A) 0 °C to steam at 100 °C
- (B) 99.9 °C to steam at 100.1 °C
- (C) 100 °C to steam at 100 °C
- (D) 0 °C to ice at 0 °C

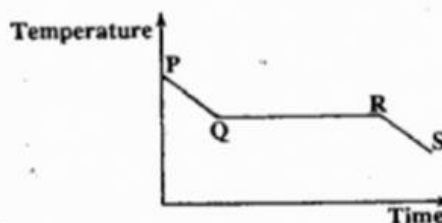
16.



Some water in a container (as shown above) is brought to its boiling point by an immersion heater. A watch is then started and the time, t , to boil off a mass, m , of water is found. If the heater has a power, P , the specific latent heat of vaporisation is

- (A) $\frac{Pt}{m}$
- (B) $\frac{P}{mt}$
- (C) $\frac{m}{Pt}$
- (D) $\frac{Pmt}{m}$

17.

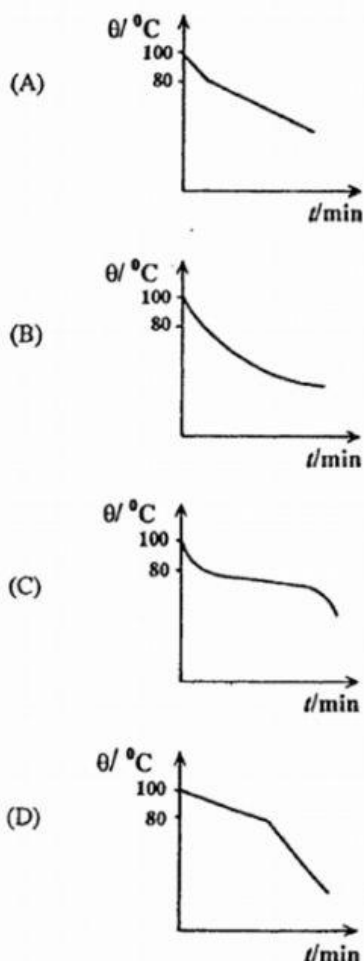


The graph above, arising from an experiment on change of phase, shows that solidification started at Q. During which of the stages is the substance in the liquid phase?

- (A) At P only
- (B) Between Q and R
- (C) Between R and S
- (D) Between P and Q

18.

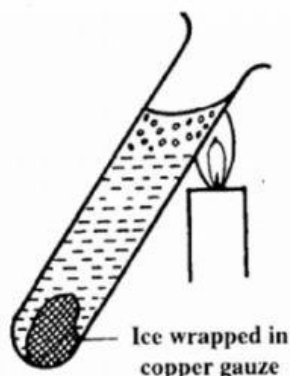
Some molten naphthalene at 100 °C is allowed to cool down at room temperature. If naphthalene has a melting point of 80 °C, which of the following BEST represents the cooling curve?



19. Which of the following is true of evaporation?

- (A) It occurs throughout a liquid at no definite temperature.
- (B) It occurs at the surface of a liquid at no definite temperature.
- (C) It occurs at the surface of a liquid at a definite temperature.
- (D) It occurs throughout a liquid at a definite temperature.

20.



The figure above shows a piece of ice wrapped in copper gauze and submerged in a glass test tube of water. The water when heated at the top boils long before the ice is melted. The MAIN reason for this is that

- (A) the test tube is a poor conductor of heat
- (B) copper is a good conductor of heat
- (C) ice is less dense than water
- (D) water is a poor conductor of heat

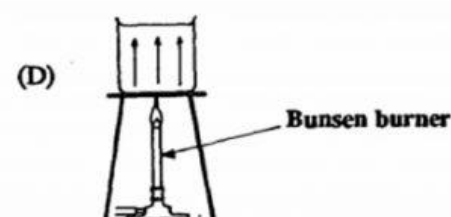
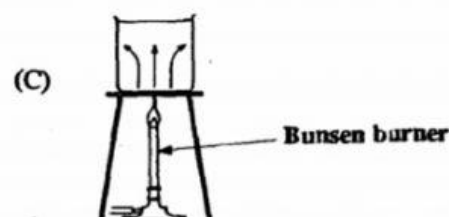
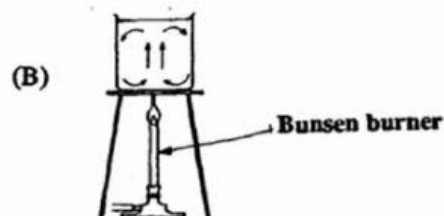
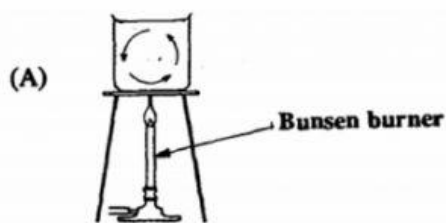
21. Which of the following would be responsible for the glass-house effect?

- (A) Infra-red rays
- (B) Light rays
- (C) Sound waves
- (D) Water waves

22. Which of the following statements concerning the radiation of heat is true?

- I. Radiation can only take place in a material medium.
 - II. A good absorber is also a good emitter of radiation.
 - III. Dark dull surfaces are better emitters than shiny ones.
- (A) III only
 - (B) I and II only
 - (C) I and III only
 - (D) II and III only

23. Which of the following diagrams BEST illustrates convection currents in a liquid?



24. In which of the following is conduction the main method of energy transfer?

- (A) Food heated in a microwave oven
- (B) Energy transferred from the sun to earth
- (C) Food being cooked on a barbecue
- (D) Food being cooked in a pot on an electric stove

25. An electric kettle full of water is plugged into the mains. The process by which heat travels through the water is

- (A) electrification
- (B) evaporation
- (C) convection
- (D) radiation