



# PHYSICS

## BOOKS - SURA PHYSICS (TAMIL ENGLISH)

### THERMAL PHYSICS

**Textbook Evaluation Choose The Correct Answer**

1. The value of universal gas constant

A.  $3.81 \text{ mol}^{-1} \text{ K}^{-1}$

B.  $8.03 \text{ mol}^{-1} \text{ K}^{-1}$

C.  $1.38 \text{ mol}^{-1} \text{ K}^{-1}$

D.  $8.31 \text{ mol}^{-1} \text{ K}^{-1}$

**Answer: D**



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2. If a substance is heated or cooled, the change in mass of that substance is

A. positive

B. negative

C. zero

D. none of above

**Answer: C**



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**3.** If a substance is heated or cooled, the linear expansion occurs along the axis is

A. X or -X

B. Y or -Y

C. both (a) and (b)

D. (a) or (b)

**Answer: C**



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4. Temperature is the average \_\_\_\_\_ of the molecules of a substance

A. difference in K.E. and P.E

B. sum of P.E. and K.E.

C. Difference in T.E. and P.E.

D. difference in K.E. and P.E

**Answer: C**



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5. In the given diagram, the possible direction of heat energy transformation is



A.  $A \leftarrow B, A \leftarrow C, B \leftarrow C$

B.  $A \rightarrow B, A \rightarrow C, B \rightarrow C$

C.  $A \rightarrow B, A \rightarrow C, B \rightarrow C$

D.  $A \leftarrow B, A \rightarrow C, B \leftarrow C$

**Answer: A**



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**Textbook Evaluation Fill In The Blanks**

1. The value of Avogadro number \_\_\_\_\_.



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2. The temperature and heat are \_\_\_\_\_ quantities.



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3. One calorie is the amount of heat energy required to raise the temperature of \_\_\_\_\_

of water through \_\_\_\_\_.



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4. According to Boyle's law , the shape of the graph between pressure and reciprocal of volume is \_\_\_\_\_.



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**Textbook Evaluation Match The Items In Column I  
To The Items In Column II**



1. 



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## Textbook Evaluation Assertion And Reason Type Questions

1. Assertion: there is no effects on other end when one end of the rod is only heated.

reason: Heat always flow from a region of lower temperature to higher temperature of the rod.

A. both the assertion and the reason are true and the reason is the correct explanation of the assertion.

B. both the assertion and the reason are true , but the reason is not the correct explanation of the assertion.

C. Assertion is true, but Reason is false.

D. Assertion is false, but the reason is true.

**Answer: C**



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2. Assertion: Gas is highly compressible than solid and liquid.

Reason: Interatomic or intermolecular distance in the gas is comparably high.

A. both the assertion and the reason are true and the reason is the correct explanation of the assertion.

B. both the assertion and the reason are true , but the reason is not the correct

explanation of the assertion.

C. Assertion is true, but Reason is false.

D. Assertion is false, but the reason is true.

**Answer: A**



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**Textbook Evaluation Answer Briefly**

**1. Define one calorie.**



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2. Distinguish between linear, areal (or) superficial expansion.



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3. What is co-efficient of cubical expansion ?



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4. State Boyle's law.



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5. State -the law of volume.



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6. Distinguish between ideal gas and real gas.



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7. What is vo-efficient or real expansion ?



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8. What is co-efficient of apparent expansion ?



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## Textbook Evaluation Numerical Problems

1. Find the final temperature of a copper rod.

Whose area of cross section changes from

$10m^2$  to  $11m^2$  due to heating. The copper rod

is initially kept at 90K. (Coefficient of superficial expansion is 0.0021/K)



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2. Calculate the coefficient of cubical expansion of a zinc bar whose volume is increased  $0.25m^3$  from  $0.3m^3$  due to change in its temperature of 50K.



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## Textbook Evaluation Answer In Detail

1. Derive the ideal gas equation.



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2. Explain the experiment of measuring the real and apparent expansion of a liquid with a neat diagram.



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## Textbook Evaluation Hot Questions

1. If you keep ice at  $0^{\circ}C$  and water at  $0^{\circ}C$  in either of your hands , in which hand you will feel more chillness ? Why ?



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## Government Exam Questions Answers

1. Write three fundamental laws of gases .



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## Additional Question Answers Choose The Correct Answer

1. Which of the following has the fastest process of heat transfer ?

A. conduction

B. convection

C. Radiation

D. all of above

**Answer: C**



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2. The function 't' which maps temperature in Celsius (C) into temperature in Fahrenheit (F)

is defined by  $t(C)=F$  where  $F = \frac{9}{5}C + 32$ .

Find the temperature when the Celsius value is equal to the Fahrenheit value.

A.  $40^\circ$

B.  $-40^\circ$

C.  $0^{\circ}$

D.  $100^{\circ}$

**Answer: B**



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**3.** In which process heat is transferred directly from one molecule to other ?

A. conduction

B. convection

C. Radiation

D. all of above

**Answer: D**



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**4. Temperature is a property which determines**

A. amount of heat of body contains

B. total absolute energy a body has

C. direction of flow of heat

D. thermal energy

**Answer: C**



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5. SI unit of temperature is \_\_\_\_\_.

A. celsius

B. fahrenheit

C. Kelvin

D. none

**Answer: C**



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6. SI unit of heat is \_\_\_\_\_.

A. calorie

B. joule

C. kilo calorie

D. kelvin

**Answer: B**





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7. All the substances will undergo the following changes like \_\_\_\_\_ when heated.

- A. increase in temperature
- B. expansion in temperature
- C. change in state
- D. all of above

**Answer: D**



8. Thermal expansion at particular temperature is less in \_\_\_\_\_.

A. solid

B. liquid

C. gas

D. all of above

**Answer: A**



9. Increase in area due to heating is called \_\_\_\_\_.

- A. Linear expansion
- B. Superficial expansion
- C. Cubical expansion
- D. real expansion

**Answer: B**



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10. Change in volume of a solid during heating is \_\_\_\_\_.

- A. Linear expansion
- B. Superficial expansion
- C. Cubical expansion
- D. apparent expansion

**Answer: C**



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11. Linear expansion is the change in \_\_\_\_\_ when object is heated or cooled.

A. length

B. area

C. volume

D. density

**Answer: A**



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12. Fundamental laws of gases are \_\_\_\_\_.

A. Boyle's law

B. Charles's law

C. Avogardo's law

D. all of above

**Answer: D**



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13. At constant temperature volume is inversely proportional to pressure of a gas is known as

- A. Boyle's law
- B. Charles's law
- C. Avogardo's law
- D. None

**Answer: A**



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14. According to Charle's law ,

A.  $P \propto \frac{1}{V}$

B.  $V \propto T$

C.  $V \propto n$

D. all of above

**Answer: B**



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15. Gas laws state the relationship between \_\_\_\_\_ properties of gas.

A. pressure

B. volume

C. Temperature & mass

D. all of above

**Answer: D**



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16. SI unit of temperature is \_\_\_\_\_.

A. K

B.  $^{\circ}C$

C.  $/^{\circ}C$

D.  $^{\circ}F$

**Answer: A**



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17. The unit of coefficient of real expansion is

\_\_\_\_\_.

A. K

B.  $^{\circ}C$

C.  $K^{-1}$

D.  $^{\circ}F$

**Answer: C**



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18. The formula for conversion of temperature from Kelvin to Celsius is \_\_\_\_\_.

A.  $C = K + 73$

B.  $C = K - 273$

C.  $C = K + 460$

D.  $C = K - 460$

**Answer: B**



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**19.** If the atoms or molecules of a gas do not interact with each other, then the gas is said to be an \_\_\_\_\_.

- A. Inert gas
- B. Ideal gas
- C. Imperfect gas
- D. Pure gas

**Answer: B**



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20. The degree of hotness or coldness of a body is called\_\_\_\_\_.

A. Energy

B. Thermal energy

C. Temperature

D. Heat capacity

**Answer: C**



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21. Charle's law is also called as \_\_\_\_\_.

A. the law of temperature

B. the law of pressure

C. the law of volume

D. the law of gas

**Answer: C**



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22. Absolute scale is also called as \_\_\_\_\_.

- A. Kelvin scale
- B. Celsius scale
- C. Centigrade scale
- D. Fahrenheit scale

**Answer: A**



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23.  $0^{\circ} K = \underline{\hspace{2cm}}^{\circ} C.$

A.  $273^{\circ} C$

B.  $243^{\circ} C$

C.  $-273^{\circ} C$

D.  $-243^{\circ} C$

**Answer: C**



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24. The amount of heat energy required to rise the temperature of 1 gram of water through  $1^{\circ}C$  is \_\_\_\_\_.

A. One kilo calorie

B. One joule

C. One kelvin

D. One calorie

**Answer: D**



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25. Thermal conduction in metal is due to\_\_\_\_\_.

- A. Free electrons
- B. bound electrons
- C. Vibration of molecules
- D. vibration of atoms

**Answer: D**



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26. When two bodies have the same temperature, they are said to be in\_\_\_\_\_.

A. thermo static

B. thermodynamic temperature

C. thermal equilibrium

D. thermal energy

**Answer: C**



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## Additional Question Answers Fill In The Blanks

1. The average kinetic energy of the molecules of a substance is called \_\_\_\_\_.



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2. Temperature is an indication of the \_\_\_\_\_ of molecules.



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3. If there is flow of thermal energy between the systems, then they are in \_\_\_\_\_.



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4. Transfer of thermal energy from one body to another is called \_\_\_\_\_.



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5. Hotness of a body is called \_\_\_\_\_.



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6. The process of heat transfer directly from molecule to molecule is called \_\_\_\_\_.



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7. Transfer of energy between any two bodies due to difference in temperature is called \_\_\_\_\_.



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8. The process in which heat energy flows from a body at a higher temperature to another object at lower temperature is \_\_\_\_\_.



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9. Transfer of heat energy from low temperature to high temperature body is called \_\_\_\_\_.



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10. The amount of heat required to raise  $1^{\circ}C$  of 1 g of water is \_\_\_\_\_.

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11. Change in dimension due to raise in temperature is called \_\_\_\_\_.

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12. The expansion of solids is \_\_\_\_\_ due to their rigid property.



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13. If there is change in length due to heating ,  
it is called \_\_\_\_\_.



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14. Superficial expansion is increase in  
\_\_\_\_\_ due to heating.



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15. Because of heating, if there is change in volume it is called \_\_\_\_\_.



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16. \_\_\_\_\_ has more expansion than solids due to rise in temperature of 1K is called \_\_\_\_\_.



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17. The unit of coefficient of real expansion is \_\_\_\_\_.



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18. Ratio of true rise in volume to original volume of liquid due to rise in temperature of 1 degree celcius is called \_\_\_\_\_.



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**19.** Coefficient of cubical expansion of liquid is independent of \_\_\_\_\_.



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**20.** According to Avogadro's law, the volume of gas is directly proportional to \_\_\_\_\_.



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21. The total number of atoms per mole of the substance is \_\_\_\_\_.



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22. The value of Avogadro number \_\_\_\_\_.



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23. At very \_\_\_\_\_ temperature and \_\_\_\_\_ pressure, real gas behave as an

ideal gas.

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24. The transfer of heat energy continues until the bodies attain the same \_\_\_\_\_.

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25. The process of transfer of heat energy, the body at \_\_\_\_\_ temperature is heated.

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26. Value of \_\_\_\_\_ is  $1.38 \times 10^{-23} JK^{-1}$



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27. Value of universal gas constant is  
\_\_\_\_\_.



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**28.** Temperature determines the direction of flow of \_\_\_\_\_.



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**29.** The temperature measured in relation to absolute zero using the \_\_\_\_\_ is known as absolute temperature.



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30. \_\_\_\_\_ is also known as thermodynamic temperature.



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31. Raising in temperature depends on \_\_\_\_\_ and \_\_\_\_\_.



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32. \_\_\_\_\_ are used in thermometer.



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33. When solid is heated , atom \_\_\_\_\_ and vibrate vigorously.



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34. Zero Kelvin is the \_\_\_\_\_ of the body.



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**35.** If two bodies are said to be in thermal equilibrium, then they will be at the \_\_\_\_\_.



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**36.** \_\_\_\_\_ is also known as heat energy.



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**37.** The rise in temperature is proportional to the amount of \_\_\_\_\_ supplied.



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38. All forms of matter undergo (solid, liquid and gas) \_\_\_\_\_ on heating.



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39. \_\_\_\_\_ will have more expansion than a liquid and solid.



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40. \_\_\_\_\_ substance have the highest expansion.



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41. If a liquid is heated directly without using any container, then the expansion is termed as \_\_\_\_\_ expansion of the liquid.



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42. \_\_\_\_\_ define as the property which determines whether a body is an equilibrium or not with its surroundings.



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43. \_\_\_\_\_ and Fahrenheit are units of temperature.



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44. The \_\_\_\_\_ of a system is not altered when it is heated or cooled.



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45. The heat gained by the cold system is \_\_\_\_\_ to the heat lost by the hot system.



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46. \_\_\_\_\_ is defined as the amount of heat energy required to rise the temperature of 1 kilogram of water through  $1^{\circ}C$ .



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47. \_\_\_\_\_ transfer from hot body to cold body.



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**48.** The heat gained by the cold system is \_\_\_\_\_ to the heat lost by the hot system.



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**49.** The process in which heat energy flows from a body at a higher temperature to another object at lower temperature is \_\_\_\_\_.



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50. the substance may change its state from one state to another state by \_\_\_\_\_.



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51. The substance will expand when \_\_\_\_\_.



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52. The extent of expansion of solids is \_\_\_\_\_ than in liquids and gases.





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53. \_\_\_\_\_ is also called as longitudinal expansion.



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54. \_\_\_\_\_ is also called as areal expansion.



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55. \_\_\_\_\_ is also called as volumetric expansion.



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56. The coefficient of cubic expansion of water is \_\_\_\_\_  $K^{-1}$ .



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57. When heated, the atoms in a liquid or gas \_\_\_\_\_ energy.



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58. Charle's law was formulated by \_\_\_\_\_.



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59. The expansion of a liquid apparently observed without considering the expansion

of the container is called the \_\_\_\_\_  
expansion of the liquid.



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60.  $P \propto \frac{1}{V}$ , is the expansion for \_\_\_\_\_ law.



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61. If the atoms or molecules of a gas do not interact with each other, then the gas is said to be an \_\_\_\_\_.



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62. \_\_\_\_\_ is also called as perfect gas.



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63. Gaseous substance has \_\_\_\_\_ compared with others.



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64. \_\_\_\_\_ will have more expansion than a liquid and solid.



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65. If a liquid is heated directly without using any container, then the expansion is termed as \_\_\_\_\_ expansion of the liquid.



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**66.** For an invariable mass of perfect gas at constant temperature, product of pressure and volume is \_\_\_\_\_.



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**67.** At constant pressure, volume of gas directly proportional to \_\_\_\_\_.



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68. According to Charle's law ,



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69. Another name of \_\_\_\_\_ is law of volume.



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70. State Avogadro's law.



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71. \_\_\_\_\_ is also called as equation of state.



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72.  $\frac{PV}{nT} = \text{constant}$  is called the \_\_\_\_\_ law of gases.



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73. The \_\_\_\_\_ is also called as equation of state.



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74. For a given heat energy, the real expansion is always more than that of \_\_\_\_\_ expansion.



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75. \_\_\_\_\_ determines the direction of flow of heat.



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76. Absolute scale of temperature is \_\_\_\_\_.



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77. Another name of absolute temperature is  
\_\_\_\_\_.



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78. Three types of expansions in solids are \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_.



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79. Linear expansion is also called as \_\_\_\_\_.



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80. The ratio of increase in length of the body per degree rise in temperature to its units

length is called \_\_\_\_\_.



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**81.** SI unit of co-efficient of linear expansion is \_\_\_\_\_.



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**82.** The equation of linear expansion is \_\_\_\_\_.



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83. Areal expansion is also called as \_\_\_\_\_.



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84. Equation for superficial expansion is \_\_\_\_\_.



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**Additional Question Answers State Whether The Following Statement Are True Or False Correct**

## The Statement If It Is False

1. Temperature is a vector quantity.



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2. the SI unit of heat energy absorbed or evolved is kelvin.



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**3.** Heat energy flows from high temperature to low temperature



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**4.** If heat is given to a body, the work done is said to be negative.



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5. Cooling is transfer of heat energy from the body at higher temperature to lower temperature.



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6. The heat gained by the cold system is \_\_\_\_\_ to the heat lost by the hot system.



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7. One calorie is the amount of heat energy required to raise the temperature of \_\_\_\_\_ of water through \_\_\_\_\_.



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8. The rise in temperature is proportional to the amount of \_\_\_\_\_ supplied.



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9. What is thermal expansion ?



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10. At constant temperature volume is inversely proportional to pressure of a gas is known as



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**11.** At constant temperature volume is inversely proportional to pressure of a gas is known as



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**12.** Total number of atoms per mole is  $6.023 \times 10^{23}$



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13.  $V \cdot n = \text{Constant}$  is Avogadro's law.



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14.  $PV/nT = \text{a constant}$  is called as equation of state.



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15. Solid, liquid and gas undergo condensation on heating.





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**16.** The unit of Avogadro's number is per mole or /mol



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**17.** Ideal gases do not obey Avogadro's law.



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18. Zero kelvin is equal to  $273^{\circ} C$ .



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[Additional](#) [Question](#) [Answers](#) [Match](#) [The](#)  
[Following](#)

1. 



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2. 



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3. 



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4. 



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5. 



[View Text Solution](#)

6. 



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7. 



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8. 



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## Additional Question Answers Assertion And Reason

1. Asserion: Temperature is the average kinetic energy of the molecules of a substance.

Reason: Temperature determines the flow of heat.

A. both the assertion and the reason are true and the reason is the correct explanation of the assertion.

B. both the assertion and the reason are true , but the reason is not the correct explanation of the assertion.

C. Assertion is true, but Reason is false.

D. both Assertion and Reason are false

**Answer: B**



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2. Assertion: Transmission of heat takes place in the conduction, Convection and Radiation.

Reason: Heat can be transferred from higher temperature to lower temperature.

A. both the assertion and the reason are true and the reason is the correct explanation of the assertion.

B. both the assertion and the reason are true , but the reason is not the correct

explanation of the assertion.

C. Assertion is true, but Reason is false.

D. both Assertion and Reason are false

**Answer: A**



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**3. Assertion:**The process of transferring heat energy from lower temperature to higher temperature is called cooling.



Reason: The mass of the system is not altered when it is cooled.

A. both the assertion and the reason are true and the reason is the correct explanation of the assertion.

B. both the assertion and the reason are true , but the reason is not the correct explanation of the assertion.

C. Assertion is true, but Reason is false.

D. both Assertion and Reason are false

**Answer: B**



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4. Assertion: For any exchange of heat, heat is gained by cold system is not equal to the heat lost by hotter system.

Reason:  $P \propto T$

A. both the assertion and the reason are true and the reason is the correct explanation of the assertion.

B. both the assertion and the reason are true , but the reason is not the correct explanation of the assertion.

C. Assertion is true, but Reason is false.

D. both Assertion and Reason are false

**Answer: D**



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5. Assertion: Fahrenheit is the smallest unit to measure temperature.

Reason: Fahrenheit was the first temperature scale used for measuring temperature.

A. both the assertion and the reason are true and the reason is the correct explanation of the assertion.

B. both the assertion and the reason are true , but the reason is not the correct explanation of the assertion.

C. Assertion is true, but Reason is false.

D. both Assertion and Reason are false

**Answer: A**



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6. Assertion: the coefficient of volumetric expansion has unit  $K^{-1}$ .

Reason: the coefficient of cubical expansion is

equal to  $\frac{\Delta V}{V \cdot \Delta T}$

A. both the assertion and the reason are true and the reason is the correct explanation of the assertion.

B. both the assertion and the reason are true , but the reason is not the correct explanation of the assertion.

C. Assertion is true, but Reason is false.

D. both Assertion and Reason are false

**Answer: A**



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7. Assertion: A beaker is completely filled with water at  $4^{\circ} C$  . It will overflow when heated or cooled.

Reason: There is expansion of water below & above  $4^{\circ} C$ .

A. both the assertion and the reason are true and the reason is the correct explanation of the assertion.

B. both the assertion and the reason are true , but the reason is not the correct explanation of the assertion.

C. Assertion is true, but Reason is false.

D. both Assertion and Reason are false

**Answer: B**



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**8. Assertion:** Two bodies at different temperatures, if brought in contact both will be in mean temperature.

**Reason:** The two bodies are made of different materials.

A. both the assertion and the reason are true and the reason is the correct explanation of the assertion.

B. both the assertion and the reason are true , but the reason is not the correct

explanation of the assertion.

C. Assertion is true, but Reason is false.

D. both Assertion and Reason are false

**Answer: C**



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**Additional Question Answers Arrange Solid  
Liquid And Gas In The Following Order**

1. Effect of pressure in decreasing order \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_.



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2. Interatomic space in increasing order \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_.



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3. Thermal expansion in decreasing order

\_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_.



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## Additional Question Answers Use The Analogy To Fill In The Blank

1. Linear expansion: Longitudinal expansion::

Superficial expansion: \_\_\_\_\_.



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2.  $\frac{V}{n} = \text{Constant} : \text{-----} \frac{V}{T} = \text{Constant} :$

Charles' law



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3. Ideal gas equation: equation of state :: Law of volume:\_\_\_\_\_.



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4.  $1.38 \times 10^{-23} JK^{-1}$ : Boltzmann Constant ::

\_\_\_\_\_ : universal gas constant



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5. 1 kcal : Heat required :: 1 joule : \_\_\_\_\_.



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6. Real gas: Atoms interact with each other::

\_\_\_\_\_ : don not interact with each other.



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7. Real expansion: heated directly :: Apparent expansion: \_\_\_\_\_.



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8. boyle's law:  $P \propto \frac{1}{v}$  :: Charle's law : \_\_\_\_\_.



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9. Aluminium :  $7 \times 10^{-5} K^{-1}$  :: Glass  
:\_\_\_\_\_.



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**Additional Question Answers Arrange The Following In Correct Sequence**

1. Write in order, the different scales of temperature used from the beginning period to till now.



Kelvin scale, Rankine scale , Celsius scale ,  
Fahrenheit scale



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2. Write the co-efficient of cubical expressions  
of the materials given below in ascending  
order.

Mercury, glass, Brass, Aluminium



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**3. Four states of matter, arrange in sequence .**

Plasma, Gas, Solid, Liquid



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## **Additional Question Answers Very Short Answers**

**1. What is thermal equilibrium ?**



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2. What is superficial expansion ?

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3. State-Avogardo's law.

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4. Define temperature.

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5. What is absolute temperature?



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6. What is meant by heating ?



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7. Name the process of heat transmission.



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**8.** What is joule ?



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**9.** Define one kilocalorie ?



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**10.** What is thermal expansion of the object ?



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**11.** What is cubical expansion ?



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**12.** What is meant by real expansion ?



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**13.** What is apparent expansion ?



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**14.** What is real gas ?



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**15.** What is ideal gas ?



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**16.** Name the expansion of volume of a liquid taking into consideration of the expansion of container also.



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## Additional Question Answers Short Answers

1. Write characteristic features of heat energy transfer.



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2. What are the changes that will occur when heat energy is given to a substance ?





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3. Define coefficient of linear expansion. Write its equation.



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4. Define coefficient of superficial expansion. Write its equation.



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5. State Charle's law (or) write the law of volume.

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6. Define one mole of a substance.

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7. What is Avogardo's number ?

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## Additional Question Answers Long Answers

1. What is thermal expansion ?



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2. Explain linear expansion of solid.



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3. With an illustration, explain the method of calculation for areal expansion of an object.



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4. With an illustrations explain the method of calculation for cubical expansion of an object.



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[Additional  
Problems](#)

[Question](#)

[Answers](#)

[Numerical](#)

1. A piece of steel has a length 2 m at 200K . At 250 K its length increases by 0.1 m. Find the coefficient of cubical expansion of steel.



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2. If boiling point of water is  $95^{\circ} F$ , what will be the reading in kelvin scale ?



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3. A metal rod 6.522 m long at 285K expands by 0.576 m at 363K. Find the coefficient of linear expansion of the metal.



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[Additional Question Answers](#) [Higher Order Thinking Hots Questions](#)

1. Air pressure in car tyre increases during driving explain.



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2. Why will a watermelon stay cool for a longer time than sandwiches when both are removed from a cooler on a hot day ?



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3. Does a substance that heats up quickly have a high or a low specific heat capacity ?



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4. Why does a metal bar appear hotter than a wooden bar at the same temperature ? Equivalently it also appears cooler than wooden bar if they are both colder than room temperature .



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