PHYSICS

BOOKS - NDA PREVIOUS YEARS

Heat & Thermodynamics

Physics

1. The thermal capacity of a substance is 5 $cal/^{\circ}F$. What is water equivalent of the substance

A. 5g

B. 9g

C. $\frac{25}{9}g$

D. 5kg

Answer: A

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2. For cooking the food, which of the following type of utensil is most suitable

A. High specific heat capacity and low conductivity

B. Low specific heat capacity and high conduetivity

C. High specific heat capacity and high conductivity

D. Low Specific heat capacity and low conductivity

Answer: B

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3. A Centigrace thermometer and Fahrenheit thermometer are dipped in boiling water. The temperature ofwater is lowered till the Fahrenheit thermometer registers half of its upper fixed point. What is the corresponding fall temperature registered by the Centrigrade thermometer

A. Half ofits range of temperature between the upper and the lower fixed points

B. Approximately $41^\circ C$

C. Approximately $59^{\circ} C$

D. $18^{\circ} c$

Answer: B

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4. Which zone of a candle flame is the hottest ? .

A. Dark innermost zone

B. Outermost zone

C. Middle luminous Zone

D. Central zone

Answer: C

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5. Two spheres of the same metal have radii in the_ratio 1 : 2 Their heat capacities are in what ratio

A. $1:2$

B. $1:4$

C. $2:1$

D. $1:8$

Answer: D

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6. Two equal amounts of water are mixed by-gently pouringboth into an insulated cup. One part is initially $90^{\circ}C$, andthe other part is

initially at $T_i^\circ C$. If the final temperature of the mixture is $131^\circ C$, what is the value of T

A. 90°

B. 68

C. 20

D. 0

Answer: D

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7. Why do two ice blocks join to form one block when pressed together

A. Melting point of ice is lowered with increase in pressure

B. Melting point of ice increases with increase in pressure

C. Melting point of ice remains unchanged with increasein pressure

D. Melting point of ice is $0^\circ C$

Answer: A

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8. Evehing Sun is not as hot as themid day sun. What is thereason

A. In the evening, radiation travel slowly

B. In the evening, the temperature of the sun decreases

C. Ozone in atmosphere absorbs more light in.the everiirig

D. In the evening, radiations travels larger distancethrough atmosphere

Answer: D

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9. When water is heated from $0^\circ C \rightarrow 20^\circ C$,how does its volume change

A. It shall increase

B. It shall decrease

C. It shall first increase and than decrease

D. It shal first decrease and then increase

Answer: D

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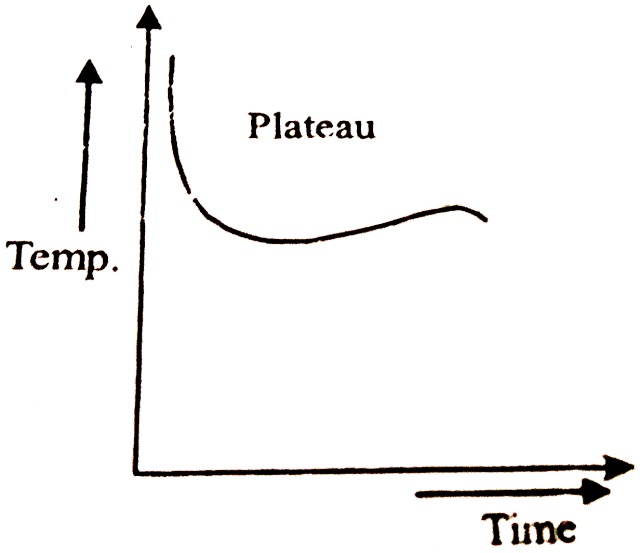
10. A sold is melted (above the melting point)and allowed to cool down at normal condition.I fa variation of temperatureas a

function of times is as shown in the figure given below.What is the reason for the plateau(flat position)in the centralregion of the cooling curve as shown hi the figure?



A. Latent heat of fusion ofther solid

B. Specific heat of the solid

C. Thermal conductivity of the solid

D. Thermal capacity of the soJid

Answer: A

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11. Which among the following thermometers is preferred for measuring temperature around $1250^{\circ} c$

A. Mercury thetmometer·

B. Constant volume gas-thermometer

C. Optical pyrometer

D. Platinum resistance thermometer ·

Answer: C

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12. Which one of the following is the_ aipount of heat given up when 20g of stream at $100^{\circ} C$ is condensed and cooled $20^{\circ} c$

A. 1000cal

B. 11400cal

C. 12400cal

D. 13600

Answer: C

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13. Which one of the following .is the mode of heat transfer in which warm material is transported so as to displace a cooler material

A. Conduction only

B. Convection only

C. Radiation

D. Both conduction and convection

Answer: B

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14. 1 g of ice at $0^\circ C$ is mixed with 1 g of steam at $100^\circ C$. After thermal equilibrium is achieved, the temperature of the mixture is

A. $0^\circ c$

B. $50^\circ c$

C. $80^\circ c$

D. $100^\circ c$

Answer: D

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15. A fan produces a feeling of comfort during hot weather, because

A. our body radiates more heat in air

B. fan supplies cool air

C. conductivity of air increases

D. our perspiration evaporates rapidly

Answer: D

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16. A man with a dark skin, in comparison with a man with a white skin, will experience

A. less heat and less cold

B. less heat and more cold

C. more heat and less cold

D. more heat and more cold

Answer: C

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17. Which one among the following denotes the smallest temperature?

A. 1° on the Celsius scale

B. 1° on the Kelvin scale

C. 1° on the Fahrenheit scale

D. 1° on the Reaumur scale

Answer: B

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18. The sun is constantly radiating energy and yet its surface temperature is nearly constant

at $6000^\circ C$. The constancy of solar temperature is due to

A. fission

B. radioactivity

C. fusion

D. black hole evaporation

Answer: C

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19. Metal pipes used to carry water sometimes burst in the winter. This is because

A. water expands when it freezes

B. metal contracts more than water

C. outside of the pipe contracts more than inside

D. metal expands more than water

Answer: A

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20. Surface temperature of Sun is

A. 2000K

B. 4000K

C. 6000K

D. 8000K

Answer: C

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21. In a pressure cooker, cooking is faster because the increases in vapour pressure

A. increases the specific heat

B. decreases the specific heat

C. decreases the boiling point

D. increases the boiling point

Answer: C

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22. The phenomenon of 'trade winds' takes place due to

A. conduction of heat

B. convection of heat

C. radiation

D. None of the above

Answer: B

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23. Thermometer A and B have ice points marked at 15° and 25° and steam points at 75° and J 25° respecti vely. When thermometer A measures the temperature of a bath as 60°, the reading ofB for the same bath is

A. 60°

B. 75°

C. 90°

D. 100°

Answer: D

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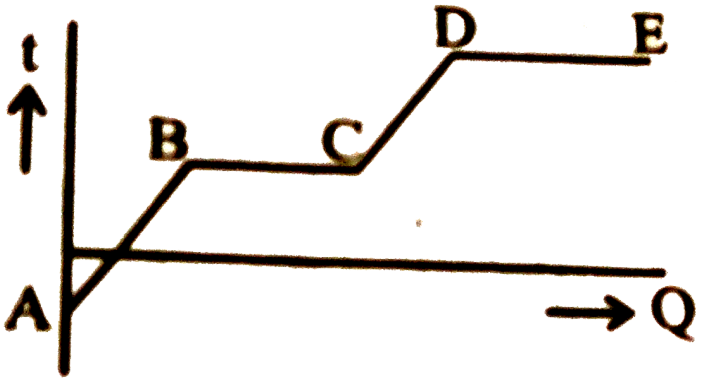

24.

The graph given above indicates change in temperature (Δt) when heat (Q) was given to a substance. Which among the following parts

of the graph correctly depict the latent heat of the substance?

A. AB and BC

B. Bc and DE

C. CD and DE

D. DE and AB

Answer: B

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25. When a solid object is immersed in water, there is a loss in its weight. This loss is

A. equal to the weight of the water displaced

B. less than the weight of the water displaced

C. greater than the weight of the water displaced

D. not related to the weight of the water displaced

Answer: A

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26. Body A of mass 2 kg and another body B of mass 4 kg and of same material are kept in the same sunshine for some interval of time. If the rise in temperature is equal for both the

bodies, then which one among the following in this regard is correct?

A. Heat absorbed by B is double because its mass is double

B. Heat absorbed by A is double because its mass is half

C. Heat absorbed by both A and B is equal because the quantity of heat absorbed does not depend upon mass

D. Heat absorbed by Bis four times than the heat absorbed by A because the quantity of heat absorbed is proportional to square of the mass

Answer: A

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27. For a steel boat floating on a lake, the weight of the water displaced by the boat is

A. less than the weight of the boat

B. more than the weight of the boat

C. equal to the weight of the part of the boat which is below the water level of the lake

D. equal to the weight of the boat

Answer: D

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28. The thermal conductivity of copper is four times that of brass. Two rods of copper and brass of same length and cross-section are joined end to end. The free end of copper rod is at $0^\circ C$ and that of brass rod at $100^\circ C$. Calculate the temperature of junction at equilibrium. neglect radiation losses.

A. 20°

B. 40°

C. 60°

D. 10°

Answer: A

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29. Which one among the following statements about thermal conductivity is correct ?

A. Steelgt Woodgt Water

B. Steel gt Water gt Wood

C. Watergt Steelgt Wood

D. Watergt Wood gt Steel

Answer: B

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30. A hot object loses heat to its surroundings in the form of heat radiation. The rate of loss of heat depends on

A. temperature of the object

B. temperature of the surroundings

C. temperature difference between the object and its surroundings

D. average temperature of the object and its surroundings

Answer: D

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31. A bucket full of hot water is kept in a room and it cools from 75°C to 70°C in T1 minutes, from 70°C to 65°C in T_2 minutes and from 65°C to 60°C in T_3 minutes. Then –

A. $T_1 = T_2 = T_3$

B. $T_1 < T_2 < T_3$

C. $T_1 > T_2 > T_3$

D. $T_1 < T_2 < T_3$

Answer: B

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32. The following question consists of two sytatements , one labelled as the Assertion (A) and the other as 'Reason (R) . You are to examine these two statements carefully and select the answer to these items using the codes given below

Assertion (A) : Ice melts at a temperature lower than $0^{\circ}C$ at a pressure higher than the normal pressure.

Reason (R) : The melting point of a substance always decreases with increase in pr~sure.

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33. he following question consists of two sytatements , one labelled as the Assertion (A) and the other as 'Reason (R) . You are to examine these two statements carefully and select the answer to these items using the codes given below

Assertion (A) : Water gets heated quickly although it is a bad conductor of heat.

Reason (R) : Water gets heated mainly by the mode of convection

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34. Statement I : A thermos flask is made of double-walled glass bottles.

Statement II: Metals are goog. conductors while gas and air are poor conductors of heat

A. Both the statements indi_vic,iµallytrue and Statement II is the correct explanatien ofStatement I.

B. Both the statements are jndividually true but Statement II is not correct explanation of Statement I

C. Statement I is true but Statement II is false

D. Statement I is false but Statement II is true.

Answer: A

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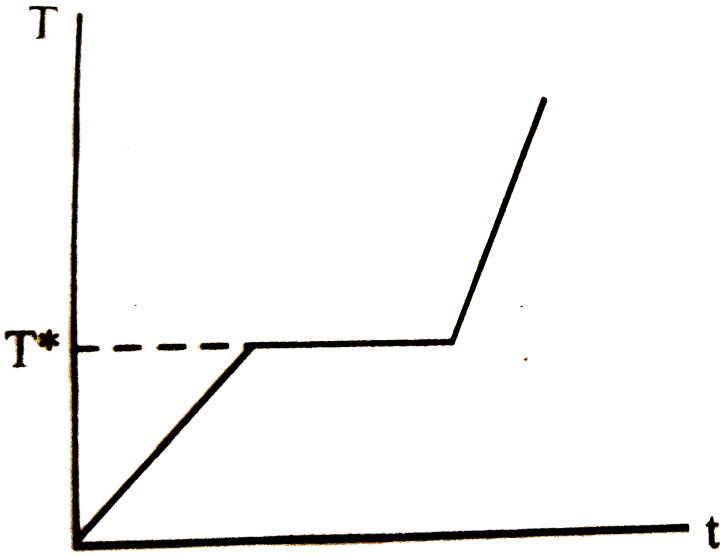
35. 

The figure given above shhows the tempreture (T)-time (t) plot when we start heating a piece of naphthalene . The temperature (T*) at the plateau of the curve signifies

A. boiling point ofnaphthalene

B. freezing point of naphthalene

C. melting point of naphthalene.

D. the temperature when naphthalene undergoes a chemical change upon heatmg.

Answer: C

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36. A pressure cooker works on the principle of

A. elevation of boiling point of water by apphcation of pressure.

B. making the food-grains softer by application of pressure.

C. making the food-grains softer by application of pressure and temperature.

D. keeping the food-grains inside steam for a longer time

Answer: A

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37. Pressure of a gas increases due to increase of its temperature because at higher temperature

A. gas molecules repel each other more.

B. potential energy of the gas molecules is higher

C. kinetic energies of the gas molecules are higher

D. gas molecules attract each other more.

Answer: C

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38. Heat given to a body which raises its temperature by $1^{\circ}C$ is

A. water equivalent

B. thermal capacity

C. specific heat

D. temperature gradient

Answer: C

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39. In.....process, no heat is exchanged between the system and the surroundings.

A. isothermal

B. adiabatic

C. isobaric

D. isotropic

Answer: B

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40. Fahrenheit and Celsius are the two scales used for measuring temperature. If the numerical value of a temperature recorded in both the scales is found to be same, what is the temperature?

A. -40°

B. $+40^\circ$

C. $+72^\circ$

D. -72°

Answer: A

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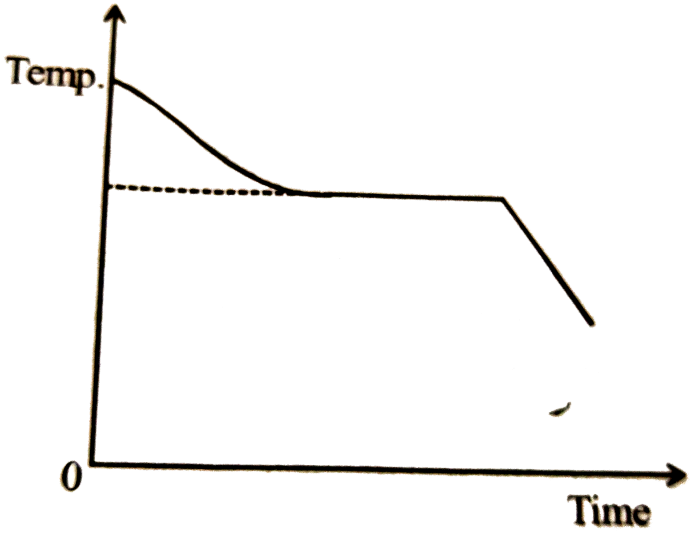
41. A solid is melted and allowed to cool and solidify again. The temperature is measured at equal intervals of time. The graph below shows the change of temperature with time.



The part of the curve that is practically horizontal due to

A. latent heat given away by the liquid

B. specific heat given away by the liquid

C. thermal capacity changes with time keeping temperature constant

D. change in density during transformation

Answer: A

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42. Thermal conductiyity of aluminium, copper and stainless steel increases in the order

A. Copper lt Aluminiumlt Stainless Steel

B. Stainless Steel ltAluminiumlt Copper

C. Aluyminium lt Copperlt Stainless Steel

D. Copperlt Stainless Steel ltAluminium

Answer: B

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43. The absolute zero, i.e., temperature below which is not achievable, is about:

A. $0^\circ c$

B. $-273K$

C. $-273^\circ c$

D. $-300^{\circ} C$

Answer: C

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44. The silvering in thermos flasks is done to avoid heat transfer by:

A. Convection

B. Conduction

C. Radiation

D. Both convection and conduction

Answer: B

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45. Which one of the following statements is not correct?

A. The Kelvin scale of temperature is called the Absolute scale

B. Visible light radiation has wavelength range of 400-700nm

C. The capacity to do work is called power

D. The wavelength of Gamma rays is less than that of X-rays

Answer: C

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46. Which one of the following is the SI unit of the thermal conductivityofa material?

A. $Wm^{-1}K^{1}$

B. $\frac{Wm}{k}$

C. $Wm^{-1}K^{1}$

D. $js^{-1}m^{-1}K^{1}$

Answer: A

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47. Which one of the following statements is not correct?

A. Conduction can occur easily in solids, less easily in liquids but hardly at all in gases

B. Heat energy is carried by moving particles in a convection current

C. Heat energy is carried by electromagnetic waves in radiation

D. The temperature at which a solid changes into a liquid is called the boiling point

Answer: D

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48. Which one of the following statements is not correct?

A. Temperatures decrease from the equator to poles

B. Temperatures in equatorial regions change substantially from January to July

C. Large landmasses located in the subarctic and arctic zones develop centres of extremely low temperatures in winter

D. Highlands are always colder than surrounding low lands

Answer: B

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49. When a solid is heated, it turns directly into a gas. This process is called

A. Condensation

B. Evaporation

C. Sublimation

D. Diffusion

Answer: C

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50. The temperature at which a solid melts to become a liquid at the atmospheric pressure is called its melting point. The melting point of a solid is an indication of

A. strength of the intermolecular forces of attraction

B. strength of the intermolecular forces of repulsion

C. molecular mass

D. molecular size

Answer: A

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51. Which one of the following .statements with regard to expansion of materials due to heating is not correct

A. As·icemelts, itexpandsuniformly up to $4^{\circ} C$

B. Mercury thermometer works using the principle of expansion due to heating

C. Small gap is kept between two rails to allow for expansion due to heating

D. The length of metallic wire increases when its temperature is increased.

Answer: A

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52. Which one of the following statements is NOT correct?

A. In the conduction mode of transference of heat, the molecules of solid pass heat from one molecule to another without moving from their positions

B. The amount of heat required to raise the temperature of a substance is called its specific heat capacity

C. The process of heat transfer in liquids and gases is through convection mode

D. The process of heat transfer from a body at higher temperature to a body at lower temperature without heating the space between them is known as radiation

Answer: B

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53. The amount of heat required to change a liquid to gaseous state without any change in temperature is known as

A. specific heat capacity

B. mechanical equivalent of heat

C. latent heat of vaporization

D. quenching

Answer: C

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54. A Kelvin thermometer and a Fahrenheit thermometer both give the same reading for a certain sampie. What would be the corresponding reading in a Celsius thermometer

A. 574

B. 301

C. 273

D. 232

Answer: B

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55. Water boils at a lower tempature at high altitudes, because

A. the air pressure is less

B. outside temperature is less

C. latest heat is less

D. None of the above

Answer: A

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56. "Heat cannot by itself flow from a body at lower temperature to a body at higher temperature" is a statement or consequence of

A. Zeroth law of thermodynamics

B. First law of thermodynamics

C. Second law of thermodynamics

D. Third law of thermodynamics

Answer: C

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57. Which one of the following statements is correct?

A. Any energy transfer that does not involve temperature difference in some way is not heat

B. Any energy transfer always requires a temperature difference

C. On heating the length and volume of the object remain exactly the same

D. Whenever there is a temperature difference, heat is the only way of energy transfer

Answer: A

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58. Which one of the following is the value of 1 kWh of energy converted into joules?

A. $1.8 \times 10^6 J$

B. $3.6 \times 10^6 J$

C. $6.0 \times 10^6 J$

D. $7.2 \times 10^6 J$

Answer: B

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59. Which of the following statements about latent heat for a given substance is/are correct?

It is fixed at a given temperature

It depends upon the temperature and volume

it is independent of temperature and volume

It depends on the temperature but independent of volume.

Select the correct answer using the code given below:

A. 2

B. 1 and 3

C. 4 only

D. 1 and 4

Answer: D

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60. Which of the following statements about specific heat of a body is/are correct?

It depends upon mass and shape of the body

It is independent of mass and shape of the body

It depends only upon the temperature of the body

Select the correct answer using the code given below

A. 1 only

B. 2 and 3

C. 1 and 3

D. 2 only

Answer: A

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61. Thermal capacity of a body depends on the

A. mass of the body only

B. mass and shape of the body only

C. density of the body

D. mass, shape and temperature of the body

Answer: A

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62. The absolute, zero temperature is O Kefvin. In $\hat{} \circ C$ unit, which one of the following is the absolute zero temperature?

A. $0^\circ C$

B. $-100^\circ C$

C. $-273.15^\circ C$

D. $-173.15^\circ C$

Answer: C

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63. Which one of the following statements regarding a thermos flask is NOT correct?

A. The walls of flask are separated by vacuum and made of glass which is a poor conductor of heat

B. The glass walls themselves have shiny surfaces

C. The surface of inner wall radiates good amount of heat and the surface of outer

wall absorbs some of the heat that is radiated from the inner wall

D. The cork supports are poor conductors of heat

Answer: C

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64. The formula for conversion between Fahrenheit and Celsius is

$^{\circ}F = X + (1.8 \times ^{\circ} C)$

What is factor X ?

A. 32

B. 22

C. 98

D. 42

Answer: A

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