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07

9TH GRADE PHYSICS • CHAPTER 07

Thermal Properties of Matter

76 High-Yield Multiple Choice Questions
Complete with Ticked Answers & Detailed Explanations

ANNUAL EXAM PREP

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Section 1: Kinetic Molecular Theory & States of Matter

Q1. According to the kinetic molecular theory, matter is composed of tiny particles called molecules which are:

A) Always at rest

B) Always in motion ✓

C) Only vibrating

D) Only rotating

Explanation:

The theory states that molecules are in continuous motion. This motion can be vibrational (solids), rotational, or linear (gases). Without this motion, temperature wouldn't exist!

Q2. The force of attraction between molecules is known as:

A) Gravitational force

B) Electrostatic force

C) Intermolecular force ✓

D) Nuclear force

Explanation:

Intermolecular force is the attractive force that holds molecules together. It is strongest in solids and weakest in gases.

Q3. What happens to the intermolecular force as the distance between molecules increases?

A) It increases

B) It decreases ✓

C) It remains constant

D) It becomes zero

Explanation:

Intermolecular forces are inversely related to distance. The farther apart the molecules are (like in gases), the weaker the attraction between them.

Q4. The energy possessed by a molecule due to its motion is called:

A) Potential energy

B) Kinetic energy ✓

C) Thermal energy

D) Chemical energy

Explanation:

Kinetic energy is the energy of motion. Since molecules are constantly moving, they possess kinetic energy. The faster they move, the higher their kinetic energy.

Q5. The sum of kinetic and potential energies of all molecules of an object is called its:

A) Heat

B) Temperature

C) Internal energy ✓

D) Thermal capacity

Explanation:

Internal energy is the total energy (motion + attraction) stored inside a substance. Heat, on the other hand, is the transfer of this energy.

Q6. In which state of matter are molecules held at fixed positions but vibrate about their mean positions?

A) Solid ✓

B) Liquid

C) Gas

D) Plasma

Explanation:

In solids, intermolecular forces are incredibly strong, locking molecules into fixed positions. They cannot move freely but can vibrate in place.

Q7. Which state of matter has a definite volume but no definite shape?

A) Solid

B) Liquid ✓

C) Gas

D) Plasma

Explanation:

Liquids have stronger forces than gases but weaker than solids. The molecules can slide over each other, taking the shape of the container, but the volume remains fixed.

Q8. Why do gases have neither a definite shape nor a definite volume?

A) High intermolecular force

B) Fixed molecular positions

C) Weak intermolecular force and large distances between molecules ✓

D) Strong vibrational motion

Explanation:

Gas molecules are very far apart, making intermolecular forces negligible. They move randomly and fill any container completely, hence no fixed shape or volume.

Q9. When a substance is heated, its temperature rises because:

A) The molecules stop moving

B) The average kinetic energy of the molecules increases ✓

C) The potential energy decreases

D) The intermolecular force increases

Explanation:

Heating transfers energy to the molecules, making them move faster. This increase in average kinetic energy is directly measured as an increase in temperature.

Q10. The temperature of a substance depends upon the:

A) Total kinetic energy of molecules

B) Average kinetic energy of molecules ✓

C) Potential energy of molecules

D) Total internal energy

Explanation:

Temperature is a measure of the average kinetic energy. Even a small cup of boiling water has a high temperature, but a large bathtub of warm water might have more total internal energy.

Section 2: Plasma — The Fourth State of Matter

Q11. Plasma is a state of matter in which most of the atoms are:

A) Neutral

B) Ionized ✓

C) Solidified

D) Liquefied

Explanation:

Plasma is essentially an ionized gas. It contains a mix of positively charged ions and free electrons.

Q12. Which of the following is NOT a component of plasma?

A) Positive ions

B) Free electrons

C) Neutral atoms (majority) ✓

D) Both A and B

Explanation:

While neutral atoms can exist, plasma is defined by a significant portion of its material being ionized (ions and electrons). Neutral atoms are the minority in a true plasma state.

Q13. Why does plasma conduct electricity?

A) It contains neutral atoms

B) It contains free electrons and positive ions ✓

C) It has high density

D) It has strong intermolecular forces

Explanation:

The presence of free-moving charged particles (electrons and ions) allows plasma to carry an electric current, unlike normal gases.

Q14. Which of the following is a natural example of plasma?

A) Ice

B) Water

C) Lightning ✓

D) Dry ice

Explanation:

Lightning is a glowing streamer of plasma. The extreme heat of lightning strips electrons from air molecules, creating a conducting path of plasma.

Q15. The Sun and stars are primarily composed of which state of matter?

A) Solid

B) Liquid

C) Gas

D) Plasma ✓

Explanation:

The extreme temperatures inside stars strip atoms of their electrons, creating a massive ball of plasma.

Section 3: Temperature, Heat, and Internal Energy

Q16. Temperature is defined as the degree of:

A) Coldness only

B) Hotness or coldness ✓

C) Internal energy

D) Heat transfer

Explanation:

Temperature tells us how hot or cold a body is relative to a standard. It determines the direction of heat flow.

Q17. Heat is a form of energy that is transferred from one body to another due to:

A) Difference in mass

B) Difference in temperature ✓

C) Difference in volume

D) Difference in density

Explanation:

Heat naturally flows from a hotter body to a colder body. This flow stops when both bodies reach the same temperature (thermal equilibrium).

Q18. Which of the following statements is TRUE?

A) A body contains heat

B) A body contains internal energy ✓

C) Heat and temperature are the same

D) Temperature is the total energy of molecules

Explanation:

This is a classic exam trick! A body does not contain heat. Heat is energy in transit. A body contains internal energy (the sum of molecular KE and PE).

Q19. The direction of flow of thermal energy is determined by:

A) Mass of the body

B) Temperature of the body ✓

C) Volume of the body

D) Density of the body

Explanation:

Thermal energy (heat) always flows from a body at a higher temperature to a body at a lower temperature, regardless of mass or volume.

Q20. When we touch ice, it feels cold because:

A) It contains coldness

B) Heat flows from our hand to the ice ✓

C) Heat flows from the ice to our hand

D) It has high internal energy

Explanation:

Our hand is warmer than the ice. Therefore, thermal energy flows from our hand into the ice, making our skin feel cold.

Q21. The average kinetic energy of molecules is directly proportional to:

A) Absolute temperature ✓

B) Volume

C) Pressure

D) Mass

Explanation:

This is a fundamental principle of kinetic molecular theory. If you double the absolute temperature (in Kelvin), the average kinetic energy of the molecules doubles.

Q22. What happens to the internal energy of a substance when it is heated?

A) It decreases

B) It increases ✓

C) It remains constant

D) It becomes zero

Explanation:

Heating increases the kinetic energy of the molecules (they move faster). Since internal energy is the sum of kinetic and potential energies, it increases.

Q23. Why is our sense of touch not a reliable measure of temperature?

A) It is always accurate

B) It can be deceived by relative temperatures ✓

C) It measures absolute zero

D) It measures internal energy

Explanation:

Our sense of touch is subjective. For example, lukewarm water might feel hot if your hand was in cold water, but cold if your hand was in hot water. It cannot give a numerical value.

Section 4: Thermometers & Thermometric Properties

Q24. A device used to measure temperature is called a:

A) Barometer

B) Thermometer ✓

C) Hygrometer

D) Manometer

Explanation:

A thermometer is specifically designed to measure temperature using a property that changes with temperature.

Q25. Which of the following is NOT a basic thermometric property?

A) Expansion of liquid

B) Change in electrical resistance

C) Change in color of a substance

D) Change in mass of a substance ✓

Explanation:

Mass does not change appreciably with temperature. Thermometric properties must change predictably with temperature, like volume, pressure, or resistance.

Q26. A good thermometric liquid should have:

A) Low boiling point

B) High freezing point

C) High expansivity ✓

D) High specific heat capacity

Explanation:

High expansivity means the liquid expands significantly for a small temperature change, making the thermometer more sensitive and easier to read.

Q27. Which of the following is an advantage of using mercury in thermometers?

A) It is opaque and easily visible ✓

B) It has a very low boiling point

C) It wets the glass

D) It is a poor conductor of heat

Explanation:

Mercury is a silvery, opaque liquid, making it easy to see in the capillary tube. It also doesn't stick to glass (doesn't wet it) and is a good conductor of heat.

Q28. Why is alcohol preferred over mercury for measuring very low temperatures?

A) Alcohol is opaque

B) Alcohol has a lower freezing point ✓

C) Alcohol has a higher boiling point

D) Alcohol is a better conductor

Explanation:

Mercury freezes at -39°C. Alcohol freezes at around -112°C, making it suitable for extremely cold environments.

Q29. The liquid-in-glass thermometer works on the principle of:

A) Expansion of glass

B) Expansion of liquid ✓

C) Change in pressure

D) Change in resistance

Explanation:

As the liquid (mercury or alcohol) heats up, it expands and rises up the narrow capillary tube. The glass expands too, but much less than the liquid.

Q30. The thin glass bulb of a liquid-in-glass thermometer is designed to:

A) Hold more liquid

B) Allow quick conduction of heat ✓

C) Prevent the liquid from freezing

D) Make the thermometer heavier

Explanation:

A thin glass wall allows heat from the object to transfer quickly to the liquid inside, ensuring a rapid response time.

Q31. Why is the bore (capillary tube) of a thermometer made very narrow?

A) To make it strong

B) To make it more sensitive ✓

C) To reduce the cost

D) To prevent the liquid from escaping

Explanation:

A narrow bore means that even a tiny expansion in the liquid's volume results in a large, easily visible movement of the liquid thread up the tube. This increases sensitivity.

Q32. Which thermometer is best suited for measuring rapidly changing temperatures?

A) Liquid-in-glass thermometer

B) Thermocouple thermometer ✓

C) Clinical thermometer

D) Gas thermometer

Explanation:

A thermocouple has a very small mass (just the junction of two wires), so it heats up and cools down almost instantly, making it perfect for rapid changes.

Q33. A clinical thermometer typically has a range of:

A) -10°C to 110°C

B) 0°C to 100°C

C) 35°C to 45°C ✓

D) -273°C to 100°C

Explanation:

The human body temperature rarely goes below 35°C or above 45°C. A narrow range makes the scale more precise for medical use.

Section 5: Temperature Scales & Conversion

Q34. The lower fixed point on the Celsius scale is:

A) 32°C

B) 0°C ✓

C) 273°C

D) -273°C

Explanation:

The lower fixed point is the ice point (melting point of pure ice), which is assigned 0°C on the Celsius scale.

Q35. The upper fixed point on the Fahrenheit scale is:

A) 100°F

B) 212°F ✓

C) 373°F

D) 180°F

Explanation:

The upper fixed point is the steam point (boiling point of water). On the Fahrenheit scale, this is 212°F.

Q36. The interval between the lower and upper fixed points on the Kelvin scale is divided into:

A) 100 equal parts ✓

B) 180 equal parts

C) 273 equal parts

D) 373 equal parts

Explanation:

The Kelvin scale has 100 divisions between the ice point (273 K) and steam point (373 K). The size of 1 Kelvin is exactly the same as 1°C.

Q37. Absolute zero is the temperature at which:

A) Water freezes

B) Molecular motion ceases ✓

C) Pressure is maximum

D) Volume is maximum

Explanation:

Absolute zero is the theoretical lowest temperature where the average kinetic energy of molecules becomes zero, meaning all motion stops.

Q38. The value of absolute zero on the Celsius scale is:

A) 0°C

B) 273°C

C) -273°C ✓

D) -100°C

Explanation:

Absolute zero is calculated to be -273.15°C, usually rounded to -273°C for 9th-grade calculations.

Q39. What is the value of absolute zero on the Kelvin scale?

A) 0 K ✓

B) 273 K

C) -273 K

D) 100 K

Explanation:

The Kelvin scale starts at absolute zero, so absolute zero is 0 K. There are no negative numbers on the Kelvin scale.

Q40. The relationship between the Kelvin (Tk) and Celsius (Tc) scales is:

A) Tk = Tc - 273

B) Tk = Tc + 273 ✓

C) Tk = Tc × 273

D) Tk = Tc / 273

Explanation:

To convert from Celsius to Kelvin, you simply add 273. For example, 0°C = 273 K.

Q41. The formula to convert Celsius (Tc) to Fahrenheit (Tf) is:

A) Tf = (9/5) Tc + 32 ✓

B) Tf = (5/9) Tc + 32

C) Tf = (9/5) Tc - 32

D) Tf = (5/9) (Tc - 32)

Explanation:

This is the standard conversion formula. Multiply by 9/5, then add 32.

Q42. If the temperature is 30°C, what is it on the Fahrenheit scale?

A) 86°F ✓

B) 54°F

C) 303°F

D) 100°F

Explanation:

Tf = (9/5)×30 + 32 = 54 + 32 = 86°F.

Q43. If the temperature is 30°C, what is it on the Kelvin scale?

A) 303 K ✓

B) 243 K

C) 86 K

D) 300 K

Explanation:

Tk = Tc + 273 = 30 + 273 = 303 K.

Q44. Which temperature scale is used for scientific measurements?

A) Celsius

B) Fahrenheit

C) Kelvin ✓

D) Centigrade

Explanation:

The Kelvin scale is the SI unit for temperature and is used globally in scientific research because it starts at absolute zero.

Q45. The zero point of the Kelvin scale is:

A) The ice point

B) The steam point

C) Absolute zero ✓

D) The freezing point of mercury

Explanation:

The Kelvin scale is an absolute scale, meaning its zero point (0 K) is the lowest possible temperature in the universe.

Section 6: Thermocouple & Advanced Thermometers

Q46. A thermocouple thermometer consists of:

A) One metal wire

B) Two wires of different metals ✓

C) A glass bulb and mercury

D) A bimetallic strip

Explanation:

A thermocouple is made by joining two wires of different metals (like copper and iron) at two junctions.

Q47. The thermocouple works on the principle that when two junctions of different metals are at different temperatures, they produce:

A) A magnetic field

B) A potential difference (voltage) ✓

C) A chemical reaction

D) Light energy

Explanation:

This is known as the Seebeck effect. The temperature difference creates a small voltage (thermo-electric current) across the junctions.

Q48. In a thermocouple, the junction kept at a known reference temperature (usually 0°C) is called the:

A) Hot junction

B) Cold junction ✓

C) Reference junction

D) Both B and C

Explanation:

The cold junction is kept in an ice bath at 0°C to provide a stable reference point. The other junction is the hot junction.

Q49. Which of the following is a major advantage of a thermocouple thermometer?

A) It is very cheap

B) It can measure very high temperatures ✓

C) It uses mercury

D) It is very large

Explanation:

Thermocouples can measure extremely high temperatures (up to 1000°C+) because the metals used have high melting points, and there is no liquid to boil away.

Q50. The thermometric property used in a gas thermometer is:

A) Volume of gas

B) Pressure of gas ✓

C) Resistance of gas

D) Color of gas

Explanation:

The pressure of a fixed mass of gas increases with temperature at constant volume. This pressure change is used to measure temperature.

Q51. The thermometric property used in a resistance thermometer is:

A) Expansion of liquid

B) Change in electrical resistance ✓

C) Change in pressure

D) Change in volume

Explanation:

The electrical resistance of a metal wire (like platinum) increases predictably as temperature increases. This property is used to measure temperature.

Q52. Which thermometer is best for measuring the temperature of a rapidly changing system?

A) Liquid-in-glass

B) Thermocouple ✓

C) Gas thermometer

D) Clinical thermometer

Explanation:

Because the thermocouple junction is just a tiny bead of metal, it has a very low heat capacity and responds almost instantly to temperature changes.

Section 7: Sensitivity, Range, Linearity & Structure

Q53. The sensitivity of a thermometer refers to its ability to:

A) Measure high temperatures

B) Detect small changes in temperature ✓

C) Measure low temperatures

D) Last a long time

Explanation:

A sensitive thermometer can detect very small temperature differences. For example, a thermometer with 0.1°C divisions is more sensitive than one with 1°C divisions.

Q54. If thermometer A has a minimum division of 1°C and thermometer B has a minimum division of 0.1°C, which is more sensitive?

A) Thermometer A

B) Thermometer B ✓

C) Both are equally sensitive

D) Cannot be determined

Explanation:

The smaller the minimum division, the more sensitive the thermometer. Thermometer B can measure to a tenth of a degree.

Q55. The range of a thermometer refers to:

A) The size of the glass bulb

B) The span of temperature it can measure accurately ✓

C) The length of the capillary tube

D) The type of liquid used

Explanation:

Range is the difference between the highest and lowest temperatures a thermometer can measure. For example, -10°C to 110°C.

Q56. A clinical thermometer has a narrow range because:

A) It is designed for human body temperature only ✓

B) It uses alcohol

C) It is very sensitive

D) It is made of plastic

Explanation:

A narrow range allows for a more precise and sensitive scale (e.g., 35°C to 45°C with 0.1°C divisions) specifically for medical diagnostics.

Q57. Linearity of a thermometer means that:

A) The scale is curved

B) Equal temperature changes produce equal scale readings ✓

C) The thermometer is very long

D) The liquid expands unevenly

Explanation:

A linear thermometer has evenly spaced markings. This ensures that a change from 10°C to 20°C moves the liquid the same distance as a change from 80°C to 90°C.

Q58. What ensures the linearity of a liquid-in-glass thermometer?

A) The type of liquid

B) The uniform diameter of the capillary tube ✓

C) The thickness of the glass bulb

D) The color of the liquid

Explanation:

A uniform (constant diameter) capillary tube ensures that the liquid's expansion is directly proportional to the temperature change, resulting in a linear scale.

Q59. Mercury freezes at:

A) 0°C

B) -39°C ✓

C) -112°C

D) 357°C

Explanation:

Mercury has a freezing point of -39°C. Below this temperature, it becomes solid and cannot be used in a thermometer.

Q60. Mercury boils at:

A) 100°C

B) 357°C ✓

C) 78°C

D) 212°C

Explanation:

Mercury has a very high boiling point of 357°C, making it suitable for measuring high temperatures.

Q61. Alcohol freezes at approximately:

A) -39°C

B) -112°C ✓

C) 0°C

D) 78°C

Explanation:

Alcohol has a very low freezing point of about -112°C, making it ideal for very cold climates.

Q62. Alcohol boils at:

A) 78°C ✓

B) 100°C

C) 357°C

D) 212°C

Explanation:

Alcohol has a low boiling point of 78°C. Therefore, it cannot be used to measure temperatures above 78°C.

Q63. Which liquid is preferred for measuring temperatures around -50°C?

A) Mercury

B) Alcohol ✓

C) Water

D) Petrol

Explanation:

Mercury would freeze at -50°C (since it freezes at -39°C). Alcohol, with a freezing point of -112°C, remains liquid and is the best choice.

Q64. Which liquid is preferred for measuring temperatures around 200°C?

A) Mercury ✓

B) Alcohol

C) Water

D) Ether

Explanation:

Alcohol would boil away at 78°C. Mercury, with a boiling point of 357°C, can easily measure 200°C.

Q65. The bulb of a liquid-in-glass thermometer is made of thin glass to:

A) Increase its volume

B) Allow quick heat transfer ✓

C) Make it fragile

D) Reduce the cost

Explanation:

Thin glass conducts heat quickly from the object to the thermometric liquid, reducing the response time of the thermometer.

Q66. If the bore of a thermometer is wide instead of narrow, what will happen?

A) Sensitivity will increase

B) Sensitivity will decrease ✓

C) Range will increase

D) Linearity will improve

Explanation:

A wide bore means the liquid level will barely rise for a small temperature change, making it harder to detect small changes (decreased sensitivity).

Q67. Which of the following is NOT a required property of a thermometric liquid?

A) It should be opaque

B) It should have a high specific heat capacity ✓

C) It should not wet glass

D) It should have uniform expansion

Explanation:

A thermometric liquid should have a low specific heat capacity so it heats up and cools down quickly with the surroundings. High specific heat capacity would make it sluggish.

Q68. The ice point and steam point are also known as:

A) Lower and upper fixed points ✓

B) Absolute zero and boiling point

C) Melting and freezing points

D) Reference and standard points

Explanation:

The ice point (0°C) is the lower fixed point, and the steam point (100°C) is the upper fixed point used to calibrate thermometers.

Q69. The pressure of a gas at constant volume increases with temperature. This property is used in:

A) Liquid-in-glass thermometer

B) Gas thermometer ✓

C) Thermocouple

D) Clinical thermometer

Explanation:

A gas thermometer measures temperature by measuring the change in pressure of a fixed volume of gas.

Q70. The resistance of a platinum wire increases with temperature. This is used in:

A) Resistance thermometer ✓

B) Thermocouple

C) Liquid-in-glass thermometer

D) Barometer

Explanation:

Platinum resistance thermometers are highly accurate and use the change in electrical resistance to measure temperature.

Q71. Which thermometer has the widest range?

A) Clinical thermometer

B) Alcohol thermometer

C) Mercury thermometer ✓

D) None of the above

Explanation:

Mercury thermometers typically have a range from -39°C to 357°C, which is much wider than alcohol (-112°C to 78°C) or clinical (35°C to 45°C) thermometers.

Q72. The unit of temperature in the SI system is:

A) Celsius

B) Fahrenheit

C) Kelvin ✓

D) Joule

Explanation:

The SI unit of thermodynamic temperature is the Kelvin (K). Celsius is widely used but is not the SI base unit.

Q73. -273°C is equal to:

A) 0 K ✓

B) 273 K

C) -273 K

D) 100 K

Explanation:

Absolute zero is -273°C on the Celsius scale, which corresponds to 0 K on the Kelvin scale.

Q74. The size of 1 degree on the Celsius scale is _____ the size of 1 Kelvin.

A) Greater than

B) Less than

C) Equal to ✓

D) Cannot be compared

Explanation:

The interval size (degree size) on the Celsius and Kelvin scales is exactly the same. Only the zero points are different (0°C = 273 K).

Q75. If a thermometer is placed in boiling water, the thread of mercury will:

A) Fall

B) Rise ✓

C) Remain stationary

D) Break the glass

Explanation:

Boiling water is at 100°C. The mercury absorbs heat, expands, and rises up the capillary tube.

Q76. The normal human body temperature is approximately:

A) 37°C

B) 98.6°F

C) 310 K

D) All of the above ✓

Explanation:

Normal body temperature is 37°C, which converts to 98.6°F and 310 K. All options are correct representations of the same temperature!

★ Well Done! ★

You've completed all 76 MCQs on

Thermal Properties of Matter — Chapter 07

Final Exam Tip

Focus on the differences between heat and temperature, the conversion formulas, and the properties of mercury vs. alcohol. These are the favorite topics for 9th-grade examiners! Good luck with your annual exams!

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— Team scholareye.xyz —