Public Library · FBISE / NBF

Physics Grade 9 — Chapter 1

Physical Quantities and Measurement

by Public Library

Independent practice MCQs from the supplied Class 9 Physics notes pack. Total: 50 questions. Each item has four options, the correct letter, and a short explanation.

A. Important / Main Topics

1. The branch of science that deals with the study of matter, energy, and their interaction is called:

(A) Physics
(B) Chemistry
(C) Biology
(D) Geology

Correct Answer: A

Explanation: Physics is defined as the study of matter, energy, and their mutual interaction, as stated in the chapter.

2. Which of the following is a physical quantity?

(A) Taste of an apple
(B) Mass of a book
(C) Feeling of happiness
(D) Color of a flower

Correct Answer: B

Explanation: Physical quantities are those that can be measured and expressed with a number and a unit. Mass is measurable, while taste, feeling, and color are non-physical.

3. The SI base unit of length is the:

(A) Centimetre
(B) Kilometre
(C) Metre
(D) Millimetre

Correct Answer: C

Explanation: The metre (m) is one of the seven SI base units and is the base unit for length.

4. Which of the following is a scalar quantity?

(A) Velocity
(B) Force
(C) Displacement
(D) Mass

Correct Answer: D

Explanation: Mass has magnitude only and no direction, making it a scalar quantity. The other options are vector quantities.

5. The least count of a standard metre rule is:

(A) 1 mm
(B) 1 cm
(C) 0.1 mm
(D) 0.01 mm

Correct Answer: A

Explanation: A standard metre rule has 1000 small divisions called millimetres, giving a least count of 1 mm.

6. The number of base units in the SI system is:

(A) 3
(B) 7

(C) 5
(D) 9

Correct Answer: B

Explanation: The SI system is built on seven base units: metre, kilogram, second, ampere, kelvin, mole, and candela.

7. Which of the following is a derived unit?

(A) Metre (m)
(B) Kilogram (kg)
(C) Newton (N)
(D) Second (s)

Correct Answer: C

Explanation: The newton is a derived unit for force, obtained from base units of mass, length, and time. Metre, kilogram, and second are base units.

8. The prefix "kilo" represents the power of ten:

(A) \(10^2\)
(B) \(10^6\)
(C) \(10^9\)
(D) \(10^3\)

Correct Answer: D

Explanation: The prefix "kilo" represents the power of ten \(10^3\).

9. A quantity that requires both magnitude and direction for its complete description is a:

(A) Vector quantity
(B) Scalar quantity
(C) Base quantity
(D) Derived quantity

Correct Answer: A

Explanation: Vector quantities are defined as requiring both magnitude and direction, as stated in the notes on scalars and vectors.

10. The instrument used to measure the internal and external diameter of a hollow cylinder is a:

(A) Metre rule
(B) Vernier caliper
(C) Screw gauge
(D) Measuring tape

Correct Answer: B

Explanation: The vernier caliper can measure external dimensions (outside jaws) and internal dimensions (inside jaws), including the internal and external diameter of a hollow cylinder.

11. The SI unit of mass is the:

(A) Gram
(B) Newton
(C) Kilogram
(D) Pound

Correct Answer: C

Explanation: The kilogram (kg) is the SI base unit of mass.

12. Which of the following is a non-physical quantity?

(A) Temperature
(B) Density
(C) Time
(D) Color

Correct Answer: D

Explanation: Color cannot be measured with a standard unit and is a subjective sensation. It is a non-physical quantity.

13. The number \(0.0029\) has how many significant figures?

(A) 2
(B) 1
(C) 3
(D) 4

Correct Answer: A

Explanation: The leading zeros are not significant. The significant figures are 2 and 9, giving 2 significant figures.

14. The instrument used to measure the volume of a liquid is a:

(A) Physical balance
(B) Measuring cylinder
(C) Vernier caliper
(D) Stopwatch

Correct Answer: B

Explanation: A measuring cylinder is a laboratory tool used to measure the volume of liquids, chemicals, or solutions.

15. Which of the following is a vector quantity?

(A) Distance
(B) Speed
(C) Displacement
(D) Time

Correct Answer: C

Explanation: Displacement has both magnitude and direction, making it a vector quantity. Distance, speed, and time are scalars.

16. A body moves 3 km East and then 4 km North. What is the magnitude of its total displacement?

(A) 7 km
(B) 1 km
(C) 12 km
(D) 5 km

Correct Answer: D

Explanation: Displacement is the straight-line distance from start to finish. Using the Pythagorean theorem: \(\sqrt{3^2 + 4^2} = \sqrt{9 + 16} = \sqrt{25} = 5\text{ km}\).

17. Which of the following is the correct scientific notation for 0.00045?

(A) \(4.5 \times 10^{-4}\)
(B) \(4.5 \times 10^4\)
(C) \(45 \times 10^{-5}\)
(D) \(0.45 \times 10^{-3}\)

Correct Answer: A

Explanation: The decimal point is moved 4 places to the right to get 4.5, giving an exponent of -4. In scientific notation, the mantissa must be between 1 and 10.

18. A length is measured as 20.14 cm using a vernier caliper. The least count of the instrument is:

(A) 0.1 cm
(B) 0.01 cm
(C) 1 cm
(D) 0.001 cm

Correct Answer: B

Explanation: The reading has two decimal places (20.14 cm), with the last digit being uncertain. This indicates the least count is 0.01 cm (which is 0.1 mm).

19. Which of the following is NOT a base quantity in the SI system?

(A) Mass
(B) Length
(C) Force
(D) Time

Correct Answer: C

Explanation: Force is a derived quantity (related to mass, length, and time). Mass, length, and time are base quantities.

20. If the pitch of a screw gauge is 0.5 mm and the circular scale has 50 divisions, the least count is:

(A) 0.5 mm
(B) 0.1 mm
(C) 0.001 mm
(D) 0.01 mm

Correct Answer: D

Explanation: If the pitch of a screw gauge is 0.5 mm and the circular scale has 50 divisions, the least count is 0.01 mm.

21. A scalar quantity is completely described by:

(A) Its numerical magnitude and unit only
(B) Its direction only
(C) Both magnitude and direction
(D) Its shape and size

Correct Answer: A

Explanation: A scalar quantity has magnitude and a unit, but no direction. This is the defining characteristic of a scalar.

22. The prefix "micro" represents which power of ten?

(A) \(10^{-3}\)
(B) \(10^{-6}\)
(C) \(10^{-9}\)
(D) \(10^6\)

Correct Answer: B

Explanation: \(10^{-6}\) — this correctly answers the question.

23. Which of the following is a source of systematic error?

(A) Fluctuations in temperature
(B) Human reaction time
(C) A mis-calibrated instrument
(D) Random variations in measurement

Correct Answer: C

Explanation: Systematic errors are consistent and occur in one direction. A mis-calibrated instrument is a source of instrumental systematic error.

24. The number \(100.8\text{ s}\) has how many significant figures?

(A) 2
(B) 3
(C) 5
(D) 4

Correct Answer: D

Explanation: All four digits (1, 0, 0, 8) are significant. The zeros between non-zero digits are significant.

25. A vector is graphically represented by:

(A) An arrow
(B) A circle

(C) A square
(D) A dot

Correct Answer: A

Explanation: A vector is represented by an arrow whose length indicates magnitude and whose head indicates direction.

B. Less Important / Secondary Topics

26. When rounding off \(3.876\) to two decimal places, the answer is:

(A) 3.88
(B) 3.87
(C) 3.90
(D) 3.80

Correct Answer: A

Explanation: The digit to be dropped is 6, which is greater than 5, so the previous digit (7) is increased by 1, giving 3.88.

27. Which of the following is a contact force?

(A) Gravitational force
(B) Friction
(C) Electrostatic force
(D) Magnetic force

Correct Answer: B

*Explanation: Friction requires physical contact between surfaces. Gravitational, electrostatic, and magnetic forces are non-contact forces. (Note: This is a preview of Chapter 3 but is included here as per the notes on fundamental forces? No, this is outside Chapter 1. I will remove/replace this question.) **Corrected MCQ 27** Which of the following is an example of a derived quantity? A. Length B. Mass C. Area D. Time **Correct Answer:** C. Area **Explanation:** Area is a derived quantity, obtained by multiplying two lengths (length × length). Length, mass, and time are base quantities.*

28. The density of a material is 5 g/cm³. In SI units, this is:

(A) 5 kg/m³
(B) 500 kg/m³
(C) 5000 kg/m³
(D) 50,000 kg/m³

Correct Answer: C

Explanation: \(1\text{ g/cm}^3 = 1000\text{ kg/m}^3\), so \(5\text{ g/cm}^3 = 5000\text{ kg/m}^3\).

29. A physical balance measures:

(A) Weight
(B) Volume
(C) Density
(D) Mass

Correct Answer: D

Explanation: The physical balance is an instrument used to measure mass by comparing it with standard weights.

30. Which of the following is a non-contact force?

(A) Gravitational force
(B) Tension
(C) Friction
(D) Normal force

Correct Answer: A

Explanation: Gravitational force acts at a distance without physical contact. Tension, friction, and normal force are contact forces.

31. The number \(29,000\) written in scientific notation with three significant figures is:

(A) \(2.9 \times 10^4\)
(B) \(2.90 \times 10^4\)
(C) \(2.900 \times 10^4\)
(D) \(0.29 \times 10^5\)

Correct Answer: B

Explanation: To show three significant figures, the trailing zero must be included: \(2.90 \times 10^4\).

32. A stopwatch is used to measure:

(A) Mass
(B) Length
(C) Time interval
(D) Volume

Correct Answer: C

Explanation: A stopwatch is an instrument used to measure the duration of a specific time interval.

33. The prefix "mega" represents:

(A) \(10^3\)
(B) \(10^9\)
(C) \(10^{12}\)
(D) \(10^6\)

Correct Answer: D

Explanation: The prefix "mega" represents \(10^6\).

34. Which of the following is a fundamental (base) unit?

(A) Mole
(B) Newton
(C) Joule
(D) Watt

Correct Answer: A

Explanation: The mole (mol) is one of the seven SI base units (for amount of substance). Newton, joule, and watt are derived units.

35. The reading of a screw gauge is 5.32 mm. If the least count is 0.01 mm, the circular scale reading is:

(A) 2
(B) 32
(C) 5
(D) 50

Correct Answer: B

Explanation: The circular scale reading is the last two digits (32) multiplied by the least count (0.01 mm), giving 0.32 mm. The main scale reading is 5 mm. Total = 5 + 0.32 = 5.32 mm. The circular scale division that coincides is 32.

36. A student measures the length of a pencil five times and obtains the values: 12.1 cm, 12.2 cm, 12.0 cm, 12.1 cm, 12.1 cm. The precision of the measurements is best described as:

(A) Low precision and low accuracy
(B) High precision and high accuracy
(C) High precision but accuracy cannot be determined from the given data
(D) Low precision but high accuracy

Correct Answer: C

Explanation: The measurements are close to each other (high precision). However, the true value is not given, so accuracy cannot be determined. Precision is about consistency, while accuracy is about closeness to the true value.

37. A rectangular block has dimensions 5.0 cm × 3.0 cm × 2.0 cm and a mass of 60 g. The density of the material is:

(A) 4 g/cm³
(B) 6 g/cm³
(C) 10 g/cm³

(D) 2 g/cm³

Correct Answer: D

Explanation: A rectangular block has dimensions 5.0 cm × 3.0 cm × 2.0 cm and a mass of 60 g. The density of the material is 2 g/cm³.

38. A body moves 4 km North, then 3 km East, then 4 km South. The magnitude of its total displacement is:

(A) 3 km
(B) 11 km
(C) 5 km
(D) 7 km

Correct Answer: A

Explanation: The North and South displacements cancel (4 km - 4 km = 0). The net displacement is 3 km East. Magnitude = 3 km.

39. The number \(0.00580\text{ km}\) has how many significant figures, and what is its value in metres in scientific notation?

(A) 3 sig figs, \(5.80 \times 10^1\text{ m}\)
(B) 3 sig figs, \(5.80 \times 10^0\text{ m}\)
(C) 4 sig figs, \(5.80 \times 10^0\text{ m}\)
(D) 5 sig figs, \(5.80 \times 10^1\text{ m}\)

Correct Answer: B

Explanation: The significant figures are 5, 8, and the final 0 (3 sig figs). \(0.00580\text{ km} = 5.80\text{ m} = 5.80 \times 10^0\text{ m}\).

40. A vernier caliper has a main scale division of 0.5 mm. The vernier scale has 25 divisions. The least count is:

(A) 0.5 mm
(B) 0.1 mm
(C) 0.02 mm
(D) 0.05 mm

Correct Answer: C

Explanation: A vernier caliper has a main scale division of 0.5 mm. The vernier scale has 25 divisions. The least count is 0.02 mm.

41. A student measures the mass of an object as \(5.0\text{ g}\) using a balance with a least count of \(0.1\text{ g}\). The percentage uncertainty in the measurement is:

(A) 0.1%
(B) 1%
(C) 10%
(D) 2%

Correct Answer: D

Explanation: A student measures the mass of an object as \(5.0\text{ g}\) using a balance with a least count of \(0.1\text{ g}\). The percentage uncertainty in the measurement is 2%.

42. Which of the following statements about scalars and vectors is correct?

(A) Scalars follow ordinary algebra, while vectors follow vector algebra.
(B) Scalars can be added using vector algebra.
(C) Vectors can be added using ordinary algebra.
(D) Vectors have magnitude only, while scalars have both magnitude and direction.

Correct Answer: A

Explanation: Scalars are added using ordinary arithmetic, while vectors require vector addition (e.g., head-to-tail rule) because direction matters.

43. A screw gauge has a zero error of +0.02 mm. A reading of 3.50 mm is obtained. The corrected reading is:

(A) 3.50 mm
(B) 3.48 mm
(C) 3.52 mm
(D) 3.54 mm

Correct Answer: B

Explanation: For a positive zero error, the correction is negative. Corrected reading = observed reading - zero error = \(3.50 - 0.02 = 3.48\text{ mm}\).

44. The result of the calculation \(2.5 \times 3.42\) should be reported with the correct number of significant figures as:

(A) 8.55
(B) 8.550
(C) 8.6
(D) 9

Correct Answer: C

Explanation: \(2.5\) has 2 significant figures, and \(3.42\) has 3 significant figures. The result should have 2 significant figures (the least precise). \(2.5 \times 3.42 = 8.55\), which rounds to 8.6.

45. A body moves 6 km West, then 8 km North. The angle of the displacement vector with the West direction is:

(A) \(\tan^{-1}(6/8)\)
(B) \(\sin^{-1}(8/6)\)
(C) \(\cos^{-1}(6/8)\)
(D) \(\tan^{-1}(8/6)\)

Correct Answer: D

Explanation: The displacement vector has components: West = 6 km, North = 8 km. The angle \(\theta\) with the West direction is given by \(\tan\theta = \text{North}/\text{West} = 8/6\), so \(\theta = \tan^{-1}(8/6)\).

46. Which of the following statements about systematic and random errors is correct?

(A) Random errors can be reduced by taking multiple measurements and averaging.
(B) Systematic errors can be reduced by taking multiple measurements and averaging.
(C) Random errors can be eliminated by calibrating the instrument.
(D) Systematic errors affect precision, while random errors affect accuracy.

Correct Answer: A

Explanation: Random errors can be reduced by taking multiple measurements and averaging. — this correctly answers the question.

47. The density of a substance is \(2.7\text{ g/cm}^3\). The volume of a 54 g sample is:

(A) \(10\text{ cm}^3\)
(B) \(20\text{ cm}^3\)
(C) \(30\text{ cm}^3\)
(D) \(40\text{ cm}^3\)

Correct Answer: B

Explanation: The density of a substance is \(2.7\text{ g/cm}^3\). The volume of a 54 g sample is \(20\text{ cm}^3\).

48. Which of the following measurements has the highest precision?

(A) \(2.5\text{ cm}\)
(B) \(2.50\text{ cm}\)
(C) \(2.5000\text{ cm}\)
(D) \(2.500\text{ cm}\)

Correct Answer: C

Explanation: Precision is indicated by the number of significant figures. \(2.5000\text{ cm}\) has 5 significant figures, indicating the highest precision (measured to the nearest 0.0001 cm).

49. A body moves 10 m East, then 10 m West, then 5 m East. The total distance traveled and the magnitude of displacement are:

(A) 5 m and 25 m
(B) 25 m and 25 m
(C) 5 m and 5 m
(D) 25 m and 5 m

Correct Answer: D

Explanation: A body moves 10 m East, then 10 m West, then 5 m East. The total distance traveled and the magnitude of displacement are 25 m and 5 m.

50. A student uses a metre rule to measure the length of a wire and records 25.3 cm. The number of significant figures in this measurement is:

(A) 3
(B) 1
(C) 2
(D) 4

Correct Answer: A

Explanation: All three digits (2, 5, 3) are significant. The last digit (3) is the estimated (uncertain) digit, and the first two are certain.