PHYSICS

BOOKS - MARVEL PHYSICS (HINGLISH)

MEASUREMENTS

Mcqs

1. An atomic clock is based upon the periodic vibrations produced is

A. Sodium atoms

B. Germanium atoms

C. Cesium atoms

D. Neon atoms

Answer: c

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2. Which one of the following is not a unit of mass?

A. metric ton

B. amu (atomic mass unit)

C. mN (millinewton)

D. quintal

Answer: c

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3. Which one from the following lies in the microscopic domain?

A. Motion of the planets round the sun

B. Diameter of the nucleus of the atom

C. Focal length of a lens

D. Rockets

Answer: b

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4. What is the solid angle subtended by a hemisphere at its centre?

A. π steradian

B. 2π steradian

C. 3π steradian

D. 4π steradian

Answer: b

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5. Which one of the following is not a unit in SI system?

A. farad

B. poise

C. pascal

D. tesla

Answer: b

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6. Which one of the following is the smallest unit?

A. Fermi

B. Angstrom

C. Micron

D. Nanometre

Answer: a

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7. The fundamental unit of time viz. the second, is based upon the vibrations of the atoms of the following element.

A. Krypton

B. Xenon

C. Cesium

D. Lithium

Answer: c

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8. Length cannot be measured in terms of

A. Fermi

B. Micron

C. Bar

D. Astronomical unit

Answer: c

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9. Which is the odd physical quantity from the following?

A. Leap year

B. Millisecond

C. Light year

D. Lunar month

Answer: c

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10. When an unknown physical quantity X is divided by the force, acting on the body, we get the velocity of the body. What is X ?

A. Work

B. Kinetic energy

C. Power

D. Linear momentum

Answer: c

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11. The total surface area and the volume of a cube are found to be equal in magnitude.

What is the volume of the cube, if the length of each side is measured in cm ?

A. $175cm^3$

B. $216cm^3$

C. $200cm^3$

D. $125cm^3$

Answer: b

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12. Which one of the following is not a unit of length?

A. Angstrom

B. Pascal

C. Ligth year

D. Parsec

Answer: b

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13. If $x = at + bt^2$, where x is the distance travelled by the body in kilometres while t is the time in seconds, then the units of b are

A. kms^2

B. kms

C. km/s^2

D. km/s

Answer: c

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14. Which one of the following is not a unit of energy?

A. Calorie

B. Electron volt

C. Megawatt

D. Watt hour

Answer: c

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15. One micron is related to centimetre as

A. 1 micron = 10^{-8} cm

B. 1 micron = 10^{-6} cm

C. 1 micron = 10^{-5} cm

D. 1 micron = 10^{-4} cm

Answer: d

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16. A volume of 100 cubic metre is equal to

A. $10^4 cm^3$

B. $10^5 cm^3$

C. $10^6 cm^3$

D. $10^8 cm^3$

Answer: d

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17. SI unit of temperature is

A. celsius

B. kelvin

C. degree celsius

D. degree kelvin

Answer: b

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18. Which one of the following is not related to time?

A. Month

B. Nanosecond

C. Year

D. Light year

Answer: d

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19. The wavelength of a spectral line is 480 nm.

What is its value in mn?

A. $480 \times 10^{-7} mm$

B. $48 \times 10^{-5} mm$

C. $48 \times 10^{-6} mm$

D. $4.8 \times 10^{-5} mm$

Answer: b

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20. Which one of the following units is correctly expressed?

A. Metre

B. Newton

C. newton

D. Joule/secc

Answer: c

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21. Which one of the following system of units is not based on the units of length, mass and time alone?

A. C.G.S.

B. F.D.S.

C. S.I.

D. M.K.S.

Answer: c

22. The unit of which one of the following physical quantities is not a derived unit?

A. Frequency

B. Charge

C. Gravitational constant

D. Electric current

Answer: d

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23. The S.I. unit of planck's constant (h) is

A. J/s^2

B. Js^2

C. J/s

D. Js

Answer: d

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24. If the units of force and length are doubled, then the unit of energy will be

A. 2 times the original

B. 4 times the original

C. $\frac{1}{4}$ times the original

D. $\frac{1}{2}$ times the original

Answer: b

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25. Which one of the following quantities is not expressed in proper units?

A. Surface tension - J/m^2

B. Rigidity modulus - N/m^2

C. Coefficient of viscosity - $N-S/m^2$

D. Potential energy - kgm/s^2

Answer: d

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26. In unit of time is taken as one year and the unit of speed is taken as the speed of light, then the unit of distance (length) is known as

A. 1Å

B. 1 fermi

C. One light year

D. 1 Parsec

Answer: c

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27. Numerical value of the magnitude of a physical quantity is

A. directly proportional to magnitude of the unit

B. inversely proportional to magnitude of the unit

C. independent of system of unit

D. either (a) or (b)

Answer: b

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28. The unit 1 N/m is equivalent to

A. 1 erg/cm

B. $1erg/cm^2$

C. 1 J/m

D. $1J/m^2$

Answer: d

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29. A new unit of length is so chosen that the speed of light in vacuum is unity. What is the distance (in this new unit) between the sun and the earth if light takes 8 min and 20 second to reach the earth from the sun?

A. 300

B. 400

C. 500

D. 600

Answer: c

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30. What is the relation between 1 astronomical unit (AU) and one parsec (P)?

A. $\frac{1AU}{1P}$ = 5 second of an arc

B. $\frac{1AU}{1P}$ = 1 second (1) of an arc

C. $\frac{1AU}{1P}$ = 3 second of an arc

D. $\frac{1AU}{1P}$ = 0.1 second of an arc

Answer: b

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31. How many metre are there in a light year?

A. $5.5 \times 10^{15} m$

B. $7.6 \times 10^{15} m$

C. $9.46 \times 10^{15} m$

D. $3.8 \times 10^{14} m$

Answer: c

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32. 2×10^{-12}m can be expressed as

A. 2 peta metre

B. 2 pico metre

C. 2 nano metre

D. 2 tera metre

Answer: b

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33. Joule/cm^3 can be a unit of

A. Impulse

B. Force

C. Pressure

D. Momentum

Answer: c

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34. Parsec' is the unit of :

A. time

B. distance

C. frequency

D. angular acceleration

Answer: b

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35. In a particular measurement system, the units of length, mass and time are chosen as 10 cm, 10 g and 0.1 s respectively. What is the unit of force in this system in terms of the units in SI system?

A. 0.1 N

B. 1 N

C. 0.5 N

D. 5 N

Answer: a

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36. The equation $\left(P+\frac{a}{V^2}\right)(V-b)$ constant. The units of a are

A. dyne $\times cm^5$

B. dyne $\times cm^4$

C. dyne cm^{-3}

D. dyne cm^{-2}

Answer: b

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37. If the units of length, mass and time are doubled, then the new unit of work expressed in terms of L, M and T

A. becomes four times

B. becomes two times

C. becomes eight times

D. is not changed

Answer: b

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38. What is the ratio of 1 KWh (kilowatt hour) to 1 MeV (million electron volt)?

A. 2.25×10^{19}

B. 2.25×10^{17}

C. 2.25×10^{23}

D. 2.25×10^{12}

Answer: a

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39. How will you express the number 43,410,00 in powers of ten?

A. 4.341×10^5

B. 4.341×10^6

C. 4.341×10^7

D. 4.341×10^8

Answer: b

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40. The distance between the sun and the earth is 1,49,500,000,000 m. How will you express it in powers of ten?

A. $1.495 \times 10^{10} m$

B. $1.495 \times 10^{12} m$

C. $1.495 \times 10^{11} m$

D. $1.495 \times 10^{-11} m$

Answer: c

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41. What is the order of magnitude of the number 8245 ?

A. 3

B. 4

C. 2

D. 5

Answer: b

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42. A student measured the diameter of a wire using a micrometer screw gauge of least count 0.001 cm. He recorded the following measurements. The correct measurement is

A. 5.3 cm

B. 5.320 cm

C. 5.32 cm

D. 5.3200 cm

Answer: b

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43. What are the orders of magnitude of the following numbers?

(i) 43760 (ii) 0.00025432 (iii) 8346002

A. $10^4, 10^{-4}, 10^7$

B. $10^4, 10^{-3}, 10^7$

C. $10^4, 10^{-5}, 10^6$

D. $10^4, 10^{-4}, 10^5$

Answer: a

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44. What is order of magnitude of $\left(10^4 + 10^2\right)$?

A. 10^6

B. 10^8

C. 10^4

D. 10^2

Answer: c

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45. The wavelength of sodium light is 0.0000005893 m. This can be expressed in powers of ten as

A. $5.893 \times 10^{-6} m$

B. $5.893 \times 10^{-7} m$

C. $5.893 \times 10^{5} m$

D. $5.893 \times 10^{-8} m$

Answer: b

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46. What is the order of magnitude of 1 light year expressed in metre?

A. 10^{14}

B. 10^{15}

C. 10^{16}

D. 10^{17}

Answer: c

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47. A student measured the diameter of a wire using a screw gauge with least count 0.001 cm and listed the measurements. The correct measurement is

A. 5.3 cm

B. 5.32 cm

C. 5.320 cm

D. 5.3200 cm

Answer: c

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48. A student measured the diameter of a solid cylinder using a micrometer screw gauge of least count 0.001 cm and took the following readings. Which is the correct measurement?

A. 1.32 cm

B. 1.3 cm

C. 1.320 cm

D. 1.3200 cm

Answer: c

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49. Give the number of significant figures in the following numbers.

(i) 15.00 kg (ii) 0.0042 m

(iii) 242.005 kg (iv) $3.638 \times 10^2 km$

A. 2, 3, 4, 6

B. 4, 2, 6, 4

C. 2, 4, 3, 4

D. 2, 2, 3, 4

Answer: b

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50. In the following numbers, the one having four significant figures is

A. 0.0004

B. 0.0078

C. 0.530

D. 5.038

Answer: d

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51. The maximum possible error in a measurement

A. is equal to the zero error of the measuring instrument

B. does not have any limit

C. is equal to the least count of the measuring instrument

D. is equal to the square of the least count of the measuring instrument

Answer: c

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52. The number of significant figures in 5.00456 is

A. 5

B. 3

C. 4

D. 6

Answer: d

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53. The length and breadth of a metal sheet are 2.325 m and 3.142 m respectively. What is

the area of this sheet using proper number of significant figures?

A. $7.30515m^2$

B. $7.3051m^2$

C. $7.305m^2$

D. $7.31m^2$

Answer: c

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54. The side of a cube is 5.052 cm. What is the volume of this cube to appropriate significant figures?

A. $V = 118.9cm^3$

B. $V = 128.9cm^3$

C. $V = 138.9cm^3$

D. $V = 148.9cm^3$

Answer: b

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55. The number of significant figures in 3257000 is

A. 7

B. 6

C. 5

D. 4

Answer: d

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56. You are given three numbers : 14.2, 0.142 and 0.00142 The number of significant figures for the three numbers are

A. 3, 3, 5

B. 3, 4, 6

C. 3, 3, 3

D. 2, 3, 3

Answer: c

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57. The number of significant figures in 52340000 is

A. 8

B. 4

C. 5

D. 6

Answer: b

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58. The length and breadth of a metal sheet are 3.124 m and 3.002 m respectively. What is the area of this metal plate ? (Use significant figures)

A. $9.378m^2$

B. $9.37m^2$

C. $9.3782m^2$

D. $9.378248m^2$

Answer: a

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59. The diameter of a circular ring is 6.28 cm. What is its circumference, taking into account the significant figures?

A. 19.72 cm

B. 19.7 cm

C. 19.73 cm

D. 19.8 cm

Answer: b

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60. Which one of the following is an example of systematic error?

A. Error in removing the parallax

B. The pointer of a voltmeter is not pivoted at the centre of the scale

C. The thermometer scale is calibrated in such a way that one degree on the thermometer is actually equal to 0.98°

D. In performing an electrical experiment, there were large voltage fluctuations.

Answer: b

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61. Error committed by a student in removing the parallax is

A. an instrumental error

B. a personal error

C. systematic error

D. a random error

Answer: b

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62. The percentage errors in the measurement of mass and speed of a body are 2% and 3% respectively. What is the percentage error in the kinetic energy obtained by measuring its mass and speed?

A. 12%

B. 10%

C. 8%

D. 2%

Answer: c

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63. The distance between two points is measured as 2.784843 m. This is to be rounded

off to 4 significant figures. Hence the value of the distance should be written as

A. 2.784 m

B. 2.785 m

C. 2.7848 m

D. 2.7849 m

Answer: b

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64. The error in the measurement of the radius of a sphere is 0.2%. What is the percentage error in the measurement of its surface area?

A. $0.2\,\%$

B. $0.4\,\%$

C. $0.6\,\%$

D. $0.8\,\%$

Answer: b

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65. What is the percentage error in the value of the density of a copper cube, if the errors in the measurement of its mass and the length of one side are 3% and 4% respectively?

A. $15\ \%$

B. $13\ \%$

C. $11\ \%$

D. $9\ \%$

Answer: a

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66. A force F is applied on a square plate of side L. If the percentage error in the determination of L is 2% and that in F is 4%. What is the permissible error in pressure?

A. 2%

B. 6%

C. 4%

D. 8 %

Answer: d

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67. The density of a cube is measured by measuring its mass and length of its sides. If the maximum error in the measurement of mass and length are 4% and 3% respectively, the maximum error in the measurement of density will be

A. 9%

B. 13%

C. 12%

D. 7%

Answer: b

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68. The error in the measurement of the diameter of a sphere is 2%. What is the

percentage error in the measurement of its volume?

A. 4%

B. 6%

C. 8%

D. 10%

Answer: b

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69. In a simple pendulum experiment, the length of the thread is measured as 102.3 cm and the diameter of the bob as 2.24 cm. What is the maximum possible error in the value of the effective length of the pendulum?

A. 1.1 cm

B. 0.011 cm

C. 0.11 cm

D. 0.111 cm

Answer: c

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70. The potential difference across the ends of a wire is found to be (100 ± 2) volt and the current flowing in the wire is found to be (10 ± 0.1)A. What is the maximum percentage error in the measurement of resistance?

A. 2%

B. 3%

C. 4%

D. 5%

Answer: b

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71. A student uses a metre scale, measuring upto 1 mm, to measure the length and breadth of a rectangular plate. He finds that length = 5.7 cm and breadth = 3.4 cm. What is the percentage error in the area of the plate ?

A. 3.5%

B. 4.7%

C. 5.3%

D. 6.2%

Answer: b

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72. While measuring the acceleration due to gravity by a simple pendulum, a student makes an error of 1% in the measurement of length and an error of 2% in the measurement of

time. If he uses the formula for g as $g = 4\pi^2\left(\frac{L}{T^2}\right)$, then the percentage error in the measurement of g will be

A. 3%

B. 4%

C. 5%

D. 6%

Answer: c

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73. A cube has a side of length $1.2 \times 10^{-2} m$.

What is its volume?

A. $1.7 \times 10^{-6} m^3$

B. $1.73 \times 10^{-6} m^3$

C. $1.70 \times 10^{-6} m^3$

D. $1.732 \times 10^{-6} m^3$

Answer: a

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74. In an experiment, we measure the quantities a, b, c and then calculate x by using the formula $x = ab^3/c^2$. The percentage errors in a, b, c are $\pm 1\%$, $\pm 3\%$ and $\pm 2\%$ respectively. What is the percentage error in x?

A. $\pm 1\%$

B. $\pm 14\%$

C. $\pm 10\%$

D. $\pm 8\%$

Answer: b

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75. Zero error is included in the category of

A. Personal errors

B. Instrumental errors

C. Accidental errors

D. Constant errors

Answer: b

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76. The error in the measurement of the radius of a sphere is 1%. Find the error in the measurement of volume.

A. 1%

B. 2%

C. 3%

D. 5%

Answer: c

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77. The least count of a stopwatch is 0.2 s. A student found the time of 25 oscillations of a simple pendulum to be 50 second. What will be the percentage error in the measurement of time?

A. $0.2\,\%$

B. $0.4\,\%$

C. $0.01\,\%$

D. 1.5%

Answer: b

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78. The dimensions of a rectangular block measured with vernier callipers having least count of 0.01 cm are 5 mm $\times$ 10 mm $\times$ 5 mm. What is the maximum percentage error in the measurement of the volume of the block?

A. 5%

B. $10\ \%$

C. $15\ \%$

D. $20\ \%$

Answer: a

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79. Poiseuille's's law for the flow of a liquid in a capillary tube is given by

$$\eta = \frac{\pi \Delta P a^4}{8LV}$$

where η = co-efficient of viscosity of a liquid

ΔP = Pressure difference across a length (L) of a tube of radius (a)

and V = Volume of the liquid flowing per second The maximum error that enters the calculations of η is due to the measurement of

A. L

B. a

C. ΔP

D. V

Answer: b

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80. The radius of a thin wire is $0.16mm$. The area of cross section taking significant figures into consideration in square millimeter is

A. 0.081

B. 0.0804

C. 0.080457

D. 0.08

Answer: d

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81. To calculate the volume of cylinder, a student is given a metre scale of least count 1 mm to measure its length and vernier callipers of least count 0.1 mm to measure its diameter. If its length and radius are 10 cm and 2 cm respectively then the percentage error in the calculated value of the volume of the cylinder will be

A. 5%

B. 4%

C. 3%

D. 2%

Answer: d

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82. In an experiment to measure the height of a bridge by dropping stone into water underneath, if the error in measurement of

time of 0.1 s at the end of 2s, then the error in estimation of height of bridge will be

A. 0.49 m

B. 0.98 m

C. 1.96 m

D. 2.12 m

Answer: c

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83. Two carbon resistances are given by $R_1 = (4 \pm 0.4)$ ohm and $R_2 = (12 \pm 0.6)\Omega$. What is their net resistance with percentage error, if they are connected in series?

A. $16\Omega \pm 5\,\%$

B. $16\Omega \pm 6.25\,\%$

C. $16\Omega \pm 8\,\%$

D. $16\Omega \pm 12\,\%$

Answer: b

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84. The length of the string of a simple pendulum is 102.6 cm and the diameter of the bob is 2.56 cm. What is the effective length of the simple pendulum by using the correct number of significant figures? (Rounding off is not to be considered.)

A. 103 cm

B. 103.88 cm

C. 103.8 cm

D. 103.9 cm

Answer: c

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85. A student obtained the value of Young's modulus of steel as $1.9 \times 10^{11} N/m^2$ while the standard value of Y is $2.1 \times 10^{11} N/m^2$. What is the percentage error in his measurement?

A. $8.5\,\%$

B. 9.5%

C. 9%

D. 10%

Answer: b

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86. The pressure on a square plate is measured by measuring the force on the plate and the length of one side of the plate. The errors in the measurement of force and length

are 3% and 2% respectively. The maximum error in the value of the pressure would be

A. 5%

B. 6%

C. 7%

D. 8%

Answer: c

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87. For finding the specific resistance of a wire, a student took the following readings by using a metre scale, a micrometer and a resistance box.

Length of the wire (L) = 100.0 cm

Radius (r) = 0.100 cm and R = 10Ω

What is the maximum possible percentage error in the value of the specific resistance?

A. $9.8\ \%$

B. $12.1\ \%$

C. $15.5\ \%$

D. $18\ \%$

Answer: b

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88. The Young's modulus (Y) of the material of a wire is given by $Y = \frac{MgL}{\pi r^2 l}$.

The percentage errors in the load (Mg) suspended at the lower end, original length (L), radius (r) and the extension (l) are 1%, 1.5%, 2% and 2.5% respectively. What is the

maximum possible percentage error in Y?

[Take $g = 10m/s^2$]

A. 5.5%

B. 7.5%

C. 9%

D. 11%

Answer: c

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89. If $X = \frac{a^3 b^2}{\sqrt{c} d}$ and percentage errors in a, b, c and d are $1\%, 2\%, 4\%$ and 4% respectively, then the error in X will be

A. 10%

B. 11%

C. 13%

D. 5%

Answer: c

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90. When a metal sphere is heated, then the maximum percentage change will be observed in its

A. area

B. radius

C. Volume

D. mass

Answer: c

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91. A wire has a mass (0.3 ± 0.003) g, radius (0.5 ± 0.005) mm and length (6 ± 0.06)cm. The maximum percentage error in the measurement of its density is

A. $4\,\%$

B. $3\,\%$

C. $2\,\%$

D. $1\,\%$

Answer: a

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92. The respective number of significant figures for the numbers 23.023, 0.0003 and 2.1×10^{-3} are

A. 4 , 4, 2

B. 5, 1, 2

C. 5, 1, 5

D. 5, 5, 2

Answer: b

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93. Resistance of a given wire is obtained by measuring the current flowing in it and the voltage difference applied across it. If the percentage errors in the measurement of the current and the voltage difference are 3% each, then error in the value of resistance of the wire is

A. Zero

B. 1%

C. 3%

D. 6%

Answer: d

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94. Identify the pair whose dimensions are equal.

A. Stress and Energy

B. Torque and Work

C. Force and Work

D. Force and Stress

Answer: b

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95. Which one of the following is dimensionally correct?

A. Moment of a force = Force per unit length

B. Moment of a force = Force per unit area

C. Moment of a force = Force per unit volume

D. Moment of a force = Force $\times$ length

Answer: d

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96. Which one of the following quantities has dimensions ?

A. Relative Density

B. Relative Refractive Index

C. Relative Velocity

D. Relative Permittivity

Answer: c

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97. Which one of the following pairs has the same dimensions ?

A. Torque and Force

B. Energy and Acceleration

C. Light Year and Wavelength

D. Velocity and Momentum

Answer: c

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98. A force F is given by $F = at + bt^2$, where t is time . What are the dimensions of a and b ?

A. $\left[M^1L^1T^3\right], \left[M^1L^1T^{-4}\right]$

B. $\left[M^2L^1T^2\right], \left[M^1L^1T^{-2}\right]$

C. $\left[M^1L^{-1}T^{-2}\right], \left[M^1L^2T^{-3}\right]$

D. $\left[M^{-1}L^1T^{-4}\right], \left[M^1L^1T^{-3}\right]$

Answer: a

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99. Solar constant is defined as energy received by Earth per cm^2 per minute. Find the dimensions of solar constant.

A. $\left[M^0L^0T^{-2}\right]$

B. $\left[M^1L^0T^{-3}\right]$

C. $\left[M^1L^1T^{-2}\right]$

D. $\left[M^2L^0T^{-2}\right]$

Answer: b

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100. The dimensions of velocity gradient are the same as that of

A. Frequency

B. Periodic time

C. Acceleration

D. angular acceleration

Answer: a

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101. According to Laplace's formula, the velocity (V) of sound in a gas is given by

$v = \sqrt{\frac{\gamma P}{\rho}}$, where P is the pressure and ρ is the density of the gas. What is the dimensional formula for γ ?

A. $\left[L^1 M^1 T^1\right]$

B. $\left[L^{-1} M^0 T^{-1}\right]$

C. $\left[L^{-1} M^0 T^1\right]$

D. $\left[L^0 M^0 T^0\right]$

Answer: d

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102. Kepler stated that the areal velocity of a planet remains constant. What are the units and dimensions of areal velocity?

A. $m/s\left[M^0L^1T^{-2}\right]$

B. $m^2/s\left[M^0L^2T^{-1}\right]$

C. $m^2/s\left[M^0L^2T^2\right]$

D. $m/s\left[M^0L^1T^{-1}\right]$

Answer: b

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103. If Force (F) and time (t) are related by the equation $F = at + bt^2$ then the dimensions of a and b are respectively given by

A. $\left[M^1L^1T^{-1}\right]\left[M^1L^{-1}T^{-2}\right]$

B. $\left[M^2L^1T^2\right]\left[M^1L^1T^{-3}\right]$

C. $\left[M^1L^1T^{-3}\right]\left[M^1L^1T^{-4}\right]$

D. $\left[M^2L^2T^{-3}\right]\left[M^{-1}L^2T^{-2}\right]$

Answer: c

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104. Which group of the following has all quantities with the same dimensions?

A. mass, length, time

B. momentum, force and impulse

C. Young's modulus, stress and pressure

D. surface tension, force constant and acceleration

Answer: c

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105. Which is the dimensional constant among the following?

A. Relative Density

B. Refractive index

C. Universal gas constant

D. Dielectric constant

Answer: c

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106. When light of wavelength λ travels through glass, the refractive index of glass varies with wavelength as $\mu = A + \frac{B}{\lambda^2}$. What are the dimensional formulae of A and B?

A. $\left[M^0L^0T^0\right]\left[M^0L^2T^{-1}\right]$

B. $\left[M^0L^1T^{-1}\right]\left[M^0L^2T^0\right]$

C. $\left[M^0L^0T^0\right]\left[M^0L^2T^0\right]$

D. $\left[M^1L^0T^1\right]\left[M^0L^1T^1\right]$

Answer: c

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107. A particle with initial velocity u is moving with uniform acceleration (a). The distance moved by the particle in the t^{th} second is given by

$$S = u + \frac{1}{2}a(2t - 1)$$

The dimensions of S must be

A. L

B. LT^{-1}

C. LT^{-2}

D. T^1

Answer: b

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108. The Bernoulli's equation is given by $P + \frac{1}{2}\rho v^2 + h\rho g = k$. Where P= pressure, ρ= density, v= speed, h=height of the liquid column, g= acceleration due to gravity and k is constant. The dimensional formula for k is same as that for:

A. Thrust

B. Pressure

C. Pressure gradient

D. Velocity gradient

Answer: b

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109. C and R denote the capacitance and resistance respectively. What is the dimensional formula of CR?

A. $\left[M^0L^0T^0\right]$

B. $\left[M^0L^0T^1\right]$

C. $\left[M^0L^0T^{-1}\right]$

D. $\left[M^1L^0T^{-1}\right]$

Answer: b

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110. Which one of the following is a dimensional constant?

A. Refractive index

B. Dielectric constant

C. Relative density

D. Gravitational constant

Answer: d

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111. According to Laplace's formula, the velocity (V) of sound in a gas is given by $v = \sqrt{\frac{\gamma P}{\rho}}$,

where P is the pressure and ρ is the density of the gas. What is the dimensional formula for γ ?

A. $\left[L^1M^1T^1\right]$

B. $\left[L^{-1}M^0T^{-1}\right]$

C. $\left[L^{-1}M^0T^1\right]$

D. $\left[L^0M^0T^0\right]$

Answer: c

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112. Kepler stated that the areal velocity of a planet remains constant. What are the units and dimensions of areal velocity?

A. $m/s\left[M^0L^1T^{-2}\right]$

B. $m^2/s\left[M^0L^2T^{-1}\right]$

C. $m^2/s\left[M^0L^2T^2\right]$

D. $m/s\left[M^0L^1T^{-1}\right]$

Answer: c

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113. Which one of the following gives the dimensional formula of coefficient of friction?

A. $\left[MLT^{-2}\right]$

B. $\left[M^2LT^{-2}\right]$

C. $\left[M^0L^0T^0\right]$

D. $\left[M^2LT\right]$

Answer: c

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114. What is the dimensional formula for pressure gradient?

A. $\left[M^1L^2T^{-1}\right]$

B. $\left[ML^{-2}T^{-2}\right]$

C. $\left[M^{-2}L^{-2}T^0\right]$

D. $\left[M^0L^2T^{-2}\right]$

Answer: b

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115. The periodic time (T) of a simple pendulum of length (L) is given by $T = 2\pi\sqrt{\frac{L}{g}}$. What is the dimensional formula of $T\sqrt{\frac{g}{L}}$?

A. $\left[M^0L^1T^0\right]$

B. $\left[M^0L^0T^0\right]$

C. $\left[M^1L^1T^{-1}\right]$

D. $\left[M^0L^{-1}T^1\right]$

Answer: b

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116. What is the dimensional formula of the term $\frac{a}{b}$ in the equation $P = \left(\frac{a+x}{b}\right)$, where P is the pressure and x is the distance?

A. $\left[M^1L^{-1}T^2\right]$

B. $\left[ML^{-1}T^{-2}\right]$

C. $\left[M^1L^2T^{-1}\right]$

D. $\left[M^{-1}L^{-2}T^1\right]$

Answer: b

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117. In the following dimensionally correct equation $F = \frac{X}{\text{Linear Density}}$, where F is the force. What is the dimensional formula for X?

A. $M^0L^0T^0$

B. MLT^{-2}

C. $M^2L^{-2}T^{-2}$

D. $M^2L^0T^{-2}$

Answer: d

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118. The distance travelled by a body moving along a straight line with uniform acceleration (a) in the nth second of its motion is given by $S_n = u + \frac{a}{2}(2n - 1)$. This equation is

A. only numerically correct only

B. only dimensionally correct only

C. correct both dimensionally and numerically

D. neither numerically nor dimensionally correct

Answer: c

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119. The damping force acting on an oscillating body is proportional to its velocity i.e. F = Kv. What is the dimensional formula for K?

A. $\left[M^1L^1T^{-1}\right]$

B. $\left[M^1L^0T^{-1}\right]$

C. $\left[M^0L^1T^{-2}\right]$

D. $\left[M^1L^0T^1\right]$

Answer: b

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120. The dimensional formula for the ratio of angular to linear momentum is

A. $\left[M^1L^1T^0\right]$

B. $\left[M^0L^1T^0\right]$

C. $\left[M^0L^2T^1\right]$

D. $\left[M^1L^2T^0\right]$

Answer: b

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121. Which physical quantities have the same dimension?

A. Couple and Work

B. Work and Power

C. Force and Power

D. Latent Heat and Specific Heat

Answer: a

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122. The expression $\left[M^1L^2T^{-2}\right]$ represents

A. Power

B. Momentum

C. Pressure

D. Kinetic Energy

Answer: d

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123. Which one of the following represents the correct dimensions of the coefficient of viscosity?

A. $\left[ML^{-1}T^{-2}\right]$

B. $\left[M^1L^1T^{-1}\right]$

C. $\left[M^1L^2T^{-2}\right]$

D. $\left[M^1L^{-1}T^{-1}\right]$

Answer: d

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124. The surface tension of a liquid is 90 dyne/cm. What is the value in SI system?

A. $9 \times 10^{-4} N/m$

B. $9 \times 10^{-2} N/m$

C. $9 \times 10^{-1} N/m$

D. $9 \times 10^{2} N/m$

Answer: b

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125. The dimensional formul for impulse is same as the dimensional formula for

A. momentum

B. Force

C. rate of change in momentum

D. acceleration

Answer: a

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126. The dimensional formula of torque is

A. ML^2T^{-1}

B. MLT^{-2}

C. MLT^{-1}

D. ML^2T^{-2}

Answer: d

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127. What is the dimensional formula for mc^2, where m and c denote the mass and velocity of a body?

A. $M^1L^1T^{-1}$

B. $M^1L^1T^{-3}$

C. $M^2L^1T^{-2}$

D. $M^1L^2T^{-2}$

Answer: d

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128. The viscous force acting on a body moving through a liquid is proportional to its velocity. What is the dimensional formula for the constant of proportional to its velocity. What

is the dimensional formula for the constant of proportionality?

A. $\left[M^1L^1T^{-1}\right]$

B. $\left[M^1L^1T^{-2}\right]$

C. $\left[M^1L^0T^{-1}\right]$

D. $\left[M^0L^1T^{-1}\right]$

Answer: c

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129. Refractive index mu is given as $\mu = A + \frac{B}{\lambda^2}$, where A and B are constants and lambda is wavelength, then dimensions of B are same as that of

A. Wavelength

B. Area

C. Volume

D. Velocity

Answer: b

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130. The ratio of the dimension of Planck's constant and that of moment of inertia is the dimension of

A. Velocity

B. Time

C. Frequency

D. Mass

Answer: c

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131. The unit of solid angle is steradian. What is the dimensional formula for steradian?

A. $\left[L^1 M^1 T^{-1}\right]$

B. $\left[L^0 M^0 T^0\right]$

C. $\left[L^2 M^{-1} T^1\right]$

D. $\left[L^{-2} M^1 T^0\right]$

Answer: b

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132. The density of a substance in C.G.S. system is 0.475 $gram/cm^3$. What is its value in SI system?

A. $0.475kg/m^3$

B. $475kg/m^3$

C. $0.0475kg/m^3$

D. $4.75kg/m^3$

Answer: b

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133. $\left(\frac{X^2}{\text{Mass}}\right)$ has the dimensions of kinetic energy. Then X has the dimensions of

A. Pressure

B. Impulse

C. Torque

D. Force

Answer: b

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134. Which one of the following is a dimensional constant?

A. Relative Density

B. Refractive index

C. Dielectric constant

D. Gravitational constant

Answer: d

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135. Which one of the following is not a dimensionless variable?

A. Dielectric constant

B. Strain

C. π

D. Refractive index

Answer: c

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136. Treating force F, length L and time T as fundamental units, what is the dimensional formula of mass?

A. $F^{+1}L^{+2}T^{+1}$

B. $F^{+2}L^{+1}T^{-1}$

C. $F^{+1}L^{-1}T^{+2}$

D. $F^{+1}L^{+1}T^{+2}$

Answer: c

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137. If the energy (E), velocity (v) and force (F) are taken as fundamental quantities, then what is the dimensional formula for mass?

A. $E^1v^2F^1$

B. $F^1v^{-1}E^1$

C. $E^1v^{-2}F^0$

D. $F^1v^{-2}E^0$

Answer: c

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138. Which one of the following physical quantities is a dimensional variable?

A. Angle

B. Relative velocity

C. Refractive index

D. Relative density

Answer: b

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139. In a system of units, the units of force and energy are 10 N and 50 J respectively. What is the unit of length in this system?

A. 3 m

B. 5 m

C. 7 m

D. 10 m

Answer: b

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140. What is the unit of 'a' in terms of fundamental units in Van der waal's equation $\left(P+\frac{a}{V^2}\right)(V-b)=RT$?

A. kgm^5/s^2

B. kgm/s

C. kgm^4s^2

D. kg^2m^3/s^2

Answer: a

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141. The equation of state for a real gas having pressure P, volume V and temperature T is expressed as

$$\left(P + \frac{a}{V^2}\right)(V - b) = RT$$

where a, b and R are constant. What are the dimensional formula of $\frac{a}{b}$?

A. $\left[M^2L^2T^{-2}\right]$

B. $\left[M^1L^1T^{-2}\right]$

C. $\left[M^1L^2T^{-2}\right]$

D. $\left[M^2L^3T^{-1}\right]$

Answer: c

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142. The velocity (V) of a particle (in cm/s) is given in terms of time (t) in sec by the equation $V = at + \frac{b}{c+t}$. The dimensions of a, b and c are

A. $\begin{matrix} a & b & c \\ L^2 & T & L^1T^{-2} \end{matrix}$

B. $\begin{matrix} a & b & c \\ L^1T^2 & L^1T & L^1 \end{matrix}$

C. $\begin{matrix} a & b & c \\ L^1T^{-2} & L^1 & T^1 \end{matrix}$

D.

a	b	c
L^1	L^1T	T^2

Answer: c

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143. What are the dimensional formulae of ω and K in the relation $y = A\sin(\omega t - Kx)$?

A. $\left[M^0L^0T^2\right]\left[M^0L^{-1}T^0\right]$

B. $\left[M^0L^0T^{-1}\right]\left[M^0L^{-1}T^0\right]$

C. $\left[M^0L^0T^{-1}\right]\left[M^0L^1T^0\right]$

D. $\left[M^0L^0T^{-1}\right]\left[M^0L^1T^{-1}\right]$

Answer: b

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144. V is the volume of a liquid flowing per second through a capillary tube of length l and radius r, under a pressure difference (p). If the velocity (v), mass (M) and time (T) are taken as the fundamental quantities, then the

dimensional formula for η in the relation $V = \frac{\pi p r^4}{8\eta l}$

A. $\left[MV^{-1}\right]$

B. $\left[M^1V^{-1}T^{-2}\right]$

C. $\left[M^1V^1T^{-2}\right]$

D. $\left[M^1V^{-1}T^{-1}\right]$

Answer: c

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145. The dimensions of $\frac{a}{b}$ in the equation $P = \frac{a - t^2}{bx}$ where P is pressure, x is distance and t is time are

A. $\left[M^1 L^1 T^{-2}\right]$

B. $\left[M^0 L^2 T^{-2}\right]$

C. $\left[M^1 L^1 T^1\right]$

D. $\left[M^1 L^0 T^{-2}\right]$

Answer: d

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146. If force, length and time are taken as fundamental units, then the dimensions of mass will be

A. $\left[F^1L^2T^{-2}\right]$

B. $\left[F^1L^{-1}T^2\right]$

C. $\left[F^0L^1T^{-2}\right]$

D. $\left[F^1L^1T^{-1}\right]$

Answer: b

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147. Planck's constant (h) and de Broglie wavelength (λ) are related through the equation $h = \lambda\sqrt{2mE}$, where 'm' and 'E' denote the mass and kinetic energy respectively of the moving particle. The dimensional formula of h is given by

A. $\left[M^2L^2T^{-2}\right]$

B. $\left[M^1L^2T^{-1}\right]$

C. $\left[M^1L^1T^{-1}\right]$

D. $\left[M^2L^{-1}T^{-2}\right]$

Answer: b

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148. A physical quantity Q is given by $Q = Q_0 e^{-\alpha t^2}$ where t is the time and α is a constant. What is the dimensional formula for α?

A. $[\alpha] = [L^0 M^0 T^0]$

B. $[\alpha] = [L^1 M^0 T^{-1}]$

C. $[\alpha] = [L^0 M^0 T^{-2}]$

D. $[\alpha] = \left[L^1 M^1 T^{-1}\right]$

Answer: c

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149. An equation of a gas is given as $\left(P + \frac{a}{V^2} = \frac{bT}{V}\right.$, where P = pressure, V = volume and T= absolute temperature of the gas and a and b are constants. What is the dimensional formula for a?

A. $\left[M^{-1} L^5 T^2\right]$

B. $\left[ML^5T^{-2}\right]$

C. $\left[ML^{-5}T^{-1}\right]$

D. $\left[ML^5T\right]$

Answer: b

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150. What is the dimensional formula of specific resistance in terms of charge Q?

A. $M^1L^2T^{-2}Q^{-1}$

B. $M^1L^2T^{-2}Q^{-2}$

C. $M^1L^3T^{-1}Q^{-2}$

D. $M^1LT^{-2}Q^{-1}$

Answer: c

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151. The angle of banking θ for a cyclist taking a turn on a curved road of radius r, with a velocity v is given by $\tan\theta = \frac{v^n}{rg}$. What is the value of n?

A. 1

B. 3

C. 2

D. 4

Answer: c

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152. The velocity of a body falling freely under acceleration due to gravity g varies as $g^p h^q$

where h is decrease in height of the body.

What are the values of p and q?

A. $\frac{1}{2}, 1$

B. $\frac{1}{2}, \frac{1}{2}$

C. $1, \frac{1}{2}$

D. $1, 1$

Answer: b

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153. Which one of the following groups have quantities that do not have the same dimensions?

A. Velocity, Speed

B. Pressure, $\frac{\text{Work}}{\text{Volume}}$

C. Force, Impulse

D. Work, Energy

Answer: c

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154. The physical quantity which has dimensional formula as that of $\frac{\text{energy}}{\text{mass} \times \text{length}}$ is

A. Force

B. Power

C. Pressure

D. acceleration

Answer: d

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155. What is the dimensional formula of $\frac{1}{\mu_0 \varepsilon_0}$ where the symbols have their usual meanings?

A. $\left[M^0 L^2 T^2\right]$

B. $\left[M^0 L^2 T^{-2}\right]$

C. $\left[M^0 L^{-1} T^2\right]$

D. $\left[M^0 L^1 T^{-1}\right]$

Answer: b

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156. A certain physical quantity is calculated from the formula $\frac{\pi}{2}\left[a^2 - b^2\right]c$, where a, b and c are all lengths. The quantity being calculated is

A. Velocity

B. Length

C. Area

D. Volume

Answer: d

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157. Which of the following operations of the functions of A and B can be performed if A and B posses different dimensions?

A. $A + B$

B. $A - B$

C. $\frac{A}{B}$

D. $\sqrt{\frac{A+B}{A-B}}$

Answer: c

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158. Which of the following physical quantities have the same dimensions?

(1) Energy density (2) Refractive index

(3) Magnetic induction (4) Pressure

A. 1 and 2

B. 2 and 3

C. 1 and 4

D. 1 and 3

Answer: c

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159. From the following physical quantities, which is the only quantity which has negative dimensions of mass?

A. Linear momentum

B. Gravitationsl constant

C. Force

D. Work

Answer: b

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160. The dimensions of length in electric field, electric flux and electric dipole moment are respectively

A. 1,2,3

B. 1,3,1

C. 3,1,2

D. 2,1,3

Answer: b

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Test Your Grasp

1. 2×10^{-12}m can be expressed as

A. 2 peta metre

B. 2 pico metre

C. 2 namo metre

D. 2 tera metre

Answer: B

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2. The distance between the sun and the earth is 1,49,500,000,000 m. How will you express it in powers of ten?

A. $1.495 \times 10^{10} m$

B. $1.495 \times 10^{12} m$

C. $1.495 \times 10^{11} m$

D. $1.495 \times 10^{-11} m$

Answer: C

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3. The diameter of a circular ring is 6.28 cm. What is its circumference, taking into account the significant figures?

A. 19.72 cm

B. 19.7 cm

C. 19.73 cm

D. 19.8 cm

Answer: B

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4. A force F is applied on a square plate of side L. If the percentage error in the determination of L is 2% and that in F is 4%. What is the permissible error in pressure?

A. 2%

B. 6%

C. 4%

D. 8%

Answer: D

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5. The potential difference across the ends of a wire is found to be (100 ± 2) volt and the current flowing in the wire is found to be (10 ± 0.1)A. What is the maximum percentage error in the measurement of resistance?

A. 2%

B. 3%

C. 4%

D. 5%

Answer: B

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6. If $X = \frac{a^3b^2}{\sqrt{c}d}$ and percentage errors in a, b, c and d are $1\%, 2\%, 4\%$ and 4% respectively, then the error in X will be

A. $10\ \%$

B. $11\ \%$

C. $13\ \%$

D. $5\ \%$

Answer: C

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7. A force is given by

$F = at + bt^2$

where , t is the time .The dimensione of a and b are

A. $\left[M^1L^1T^3\right], \left[M^1L^1T^{-4}\right]$

B. $\left[M^2L^1T^2\right], \left[M^1L^1T^{-2}\right]$

C. $\left[M^1L^{-1}T^{-2}\right], \left[M^1L^2T^{-3}\right]$

D. $\left[M^{-1}L^1T^{-4}\right], \left[M^1L^1T^{-3}\right]$

Answer: A

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8. Which one of the following gives the dimensional formula of coefficient of friction?

A. $\left[MLT^{-2}\right]$

B. $\left[M^2LT^{-2}\right]$

C. $\left[M^0L^0T^0\right]$

D. $\left[M^2LT\right]$

Answer: C

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9. The refractive index of a medium is given by $\mu = A + \frac{B}{\lambda^2}$ where A and B are constants and λ is the wavelength of light.

Then the dimensions of B are the same as that of

A. Wavelength

B. Area

C. Volume

D. Velocity

Answer: B

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10. V is the volume of a liquid flowing per second through a capillary tube of length l and radius r, under a pressure difference (p). If the velocity (v), mass (M) and time (T) are taken as the fundamental quantities, then the dimensional formula for η in the relation $V = \frac{\pi p r^4}{8\eta l}$

A. $\left[Mv^{-1}\right]$

B. $\left[M^1 v^{-1} T^{-2}\right]$

C. $\left[M^1 v^1 T^{-2}\right]$

D. $\left[M^1 v^{-1} T^{-1}\right]$

Answer: C

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