1. The mass of a box is 2.3 kg. Two marbles of masses 2.15 g and 12.39 g are added to it. The total mass of the box to the correct number of significant figures is
(a) 2.340 kg (b) 2.3145 kg. (c) 2.3 kg (d) 2.31 kg

2. The length of a rectangular sheet is 1.5 cm and breadth is 1.203 cm. The area of the face of rectangular sheet to the correct no. of significant figures is :
(a) 1.8045 cm^2 (b) 1.804 cm^2
(c) 1.805 cm^2 (d) 1.8 cm^2

3. Taking into account the significant figures, what is the value of 9.99 m + 0.0099 m
(a) 10.00 m (b) 10 m (c) 9.9999 m (d) 10.0 m

4. The number of the significant figures in 11.118×10^{-6} V is
(a) 3 (b) 4 (c) 5 (d) 6

5. Each side a cube is measured to be 7.203 m. The volume of the cube up to appropriate significant figures is
(a) 373.714 (b) 373.71 (c) 373.7 (d) 373

6. A spherometer has 20 threads per cm. Its circular scale has 100 divisions. Find the least count of spheometer
(a) 5 μm (b) 50 μm (c) 0.5μm (d) 0.05μm

7. A scientist performs an experiment and takes 50 readings. He repeats the same experiment and now takes 200 readings. By doing so:
(a) Both the systematic and random errors remain unchanged.
(b) Both the systematic and random errors are reduced by a factor of 1/4.
(c) The systematic error remains unchanged and random error is reduced by a factor of 1/4.
(d) The systematic is reduced by a factor of 1/4 and random error remains unchanged.

8. The maximum error in the measurement of mass and length of the side of a cube are 2% and 1% respectively. The maximum error in its density is-
(a) 2% (b) 1% (c) 3% (d) 5%

9. The measured mass and volume of a body are 22.42 g and 4.7 cm^3 respectively. With possible errors of 0.01 g and 0.1 cm^3 in mass and volume, the maximum error in the calculated density is approximately-
(a) 0.2% (b) 2% (c) 5% (d) 10%

10. The heat dissipated (I^2Rt) in a resistance can be obtained by the measurement of resistance, current and time. If the maximum percentage error in the measurement of these quantities is 1%, 2%, and 1% respectively. The maximum percentage error in the determination of the dissipated heat is 002D
(a) 4% (b) 6% (c) 4/3% (d) 2%

11. The percentage error in the measurement of mass and speed are 2% and 3% respectively. How much will be the maximum percentage error in the estimate of kinetic energy obtained by measuring mass and speed -
(a) 11% (b) 8% (c) 5% (d) 4%

12. A wire is of mass (0.3 ± .003) gm. The radius is (0.5 ± 0.005) cm and length is (6 ± .06) cm. The maximum percentage error in density is -
(a) 3% (b) 4% (c) 8% (d) 16%

13. A physical quantity is represented by $X = M^aL^b T^{-c}$. If percentage errors in the measurements of M, L and T are α%, β% and γ% respectively, then total percentage error is–
(a) (αa + βb – γc)% (b) (αa + βb + γc)%
(c) (αa – βb – γc)% (d) 0%

14. The length, breadth and thickness of a strip are:
(10.0 ± 0.1) cm, (1.00 ± 0.01) cm and (0.100 ± 0.001) cm respectively. The most probable error in its volume will be:
(a) ± 0. 111 cm^3 (b) ± 0.012 cm^3
(c) ± 0.03 cm^3 (d) None of these

15. If $\theta_1 = (10 \pm 0.1)^0C$ and $\theta_2 = (20 \pm 0.4)^0C$, then $\theta_2 - \theta_1$ = …..
(a) $(10 \pm 0.3)^0C$ (b) $(10 \pm 0.1)^0C$
(c) $(10 \pm 0.4)^0C$ (d) $(10 \pm 0.5)^0C$

16. A wire is of mass (0.3 ± .003) gm. The radius is (0.5 ± 0.005) cm and length is (6 ± .06) cm. The maximum percentage error in density is -
(a) 3% (b) 4% (c) 8% (d) 16%

17. The percentage errors in the measurement of mass and speed are 2% and 3% respectively. How much will be the maximum error in the estimation of the kinetic energy obtained by measuring mass and speed -
(a) 11% (b) 8% (c) 5% (d) 1%

18. In a resonance tube with tuning fork of frequency 512 Hz, first resonance occurs at water level equal to 30.3 cm and second resonance occurs at 63.7cm. The maximum possible error in the speed is -
(a) 51.2 cm/sec. (b) 102.4 cm/sec
(c) 204.8 cm/sec (d) 153.6 cm/sì

19. An unknown body is measured with a meter scale of unequal length if the mass appears 10g and 11g when it is kept on both the pans respectively. The true mass is -
(a) 10.48 g (b) 10.00 g (c) 11.00 g (d) 10.50 g

20. The distance advanced by screw of a screw gauge is 2mm in four rotation. Its cap is divided into 50 division. There is no zero error. If the screw reads 3 divisions on the main scale and 32 divisions on the cap, then the diameter of the wire is -
(a) 3.32 mm (b) 1.82 mm (c) 2.82 mm (d) 4.7 mm

21. A body weights 24.2g when placed in one pan of a balance and 20g when placed in other. What is the true mass of the body if the arms have unequal length ?
(a) 24.2g (b) 20 g (c) 22 g (d) 22.1 g

22. The arms of a physical balance are equal but an object weighs 7.00 kg when placed in the left pan and 7.50 kg placed in the right pan. What is the actual mass of the object ?
(a) 7.00 kg (b) 7.25 kg (c) 7.50 kg (d) 7.15 kg

23. Vernier scale of Vernier calipers has 50 divisions which coincide with 49 main scale divisions. Find the Vernier constant. Given: there are 20 main scale divisions cm^{-1}.
(a) 100 µm (b) 1000 µm
(c) 10 µm (d) None of these

24. A screw gauge has a least count of 0.001 cm. The number of devisions through which zero mark of circular scale has crossed the refrence line is 2. The zero error is –
(a) –0.02 mm (b) –0.005 cm (c) + 0.02 (d) + 0.02 cm

25. In a resonance tube experiment the first resonance is obtained at 10 cm of air column and the second for 32 cm, the end correction is -
(a) 0.5 cm (b) 1 cm (c) 1.5 cm (d) 2 cm

26. A balance has pans of unequal weight but arms are of equal length. The weight of body in one pan is measured as 8 kg and when pans are interchanged the weight of body measured is 18 kg. The true weight of body is -
(a) 13 kg (b) 12 kg
(c) 10 kg (d) data is insufficient

27. In given screw gauge, if pitch is 1 mm and circular scale has 100 divisions. When nothing is put between the jaws A and B which just closed then 13 divisions of C.S. are below the zero of reference line on linear or main scale. When a wire is placed between the jaws two linear scale divisions are clearly visible while 73 divisions on circular scale coincide with reference line. The error in this question is -

(a) + 0.13 mm (b) + 1.30 mm

(c) – 0.73 mm (d) – 7.30 mm

28. An object is weighed on a balance whose pans are not equal in masses when placed in the left pan, the object appears to weigh 10.30g but when placed in the right pan, it appears to weigh 12.62g. What is the correct mass of the object?

(a) 10.30 g (b) 12.62 g (c) 11.46 g (d) Can not find

29. The pitch of a screw guage is 1mm and there are 100 divisions on its circular scale. During the process of finding the zero error, a student finds that the zero of the circular scale lies 4 divisions below the reference line. When an experimental steel wire is placed between the studs two main scale divisions are clearly visible and 57 divisions on the circular scale are observed. The diameter of the wire is-

(a) 2.53 mm (b) 2.61 mm (c) 2.57 mm (d) 2.63 mm

30. Tomeasure the length of cylinder, a student uses the vernier calipers, whose main scale reads in millimeter and its vernier is divided into 10 divisions which coincide with 9 divisions of the main scale. He observed that when the two jaws of the instrument touch each other the eighth division of the vernier scale coincides with any one of the mains scale division and the zero of the vernier lies to the right of the zero of main scale. When he placed a cylinder tightly along its length between the two jaws the zero of the vernier scale lies slightly to the left of 42 mm and the fourth vernier division coincides with a scale division. The length of the cylinder measured by the student is-

(a) 4.14 cm (b) 4.24 cm (c) 4.06 cm (d) 4.22 cm

1. (c)

Total mass $= 2.3 + 0.00215 + 0.01239 = 2.31\,kg$

Total mass in appropriate significant figures be 2.3 *kg*.

2. (d)

Area $= 1.5 \times 1.203 = 1.8045\ cm^2 = 1.8\,cm^2$ (Upto correct number of significant figure).

3. (a)

$9.99\,m + 0.0099\,m = 9.999\,m = 10.00\,m$ (In proper significant figures).

4. (c)

The number of significant figure is 5 as 10^{-6} does not affect this number.

5. (c)

Volume $= a^3 = (7.023)^3 = 373.715 m^3$

In significant figures volume of cube will be $373.7\,m^3$ because its side has four significant figures.

6. (a)

Least count = $\dfrac{\text{pitch}}{\text{number of division on circular scale}}$

$\dfrac{0.1}{2} = 0.5 \times 10^{-3}\,\text{cm}$

7. (c)

Systematic error is due to faculty instrument, parallax etc. and is always unidirectional. It can not be reduced by increasing number of readings. Random error or probable error can be positive or negative in each reading and large number of reading reduced its effect.

8. (d)

$\rho = \dfrac{m}{a^3} \Rightarrow \%\,(\rho) = \%\,(m) + 3 \times \%\,(a) = 5\%$

9. (b)

$d = \dfrac{m}{V}$ % error in d = 1 × [% error in m] + 1× [1% error in V]

$= \dfrac{.01}{22.42} \times 100 + \dfrac{.1}{4.7} \times 100$

= 2%

10. (b)

$\dfrac{\Delta H}{H} \times 100 = \dfrac{2\Delta I}{I} \times 100 + \dfrac{\Delta R}{R} \times 100 + \dfrac{\Delta t}{t} \times 100$

= 2 × 2% + 1% + 1% = 6%

11. (b)

$\dfrac{\Delta k}{k} \times 100 = \dfrac{\Delta m}{m} \times 100 + 2\dfrac{\Delta v}{v} \times 100$

= 2% + 2× 3% = 8%

12. (b)`

$p = \frac{m}{\pi r^2 \ell}$

$\frac{\Delta p}{P} \times 100 = \frac{\Delta m}{m} \times 100 + \frac{2\Delta r}{r} \times 100 + \frac{\Delta \ell}{\ell} \times 100$ q

13. (b)

$\frac{\Delta x}{x} = a\left(\frac{\Delta M}{M}\right) + b\left(\frac{\Delta L}{L}\right) + c\left(\frac{\Delta T}{T}\right)$

14. (c)

Volume = $\ell \times b \times t$

% error in volume

= [% error in ℓ] + [% error in b] + [% error in t]

= 1% + 1% + 1% = 3%

Now % error in volume = $\frac{\Delta V}{V} \times 100$

$3 = \frac{\Delta V}{10 \times 1 \times .1} \times 100$

Hence $\Delta V = 0.03\ cm^3$

15. (d)

$\theta_2 - \theta_1 = (10 \pm 0.5)\ ^0C$

16. (b)

$\frac{\Delta P}{P} \times 100$

$= \frac{\Delta m}{m} \times 100 + \frac{\Delta \ell}{\ell} \times 100 + \frac{2\Delta r}{r} \times 100$

17. (b)

$\therefore E = \frac{1}{2} mv^2$

∴ % Error in K.E.

= % error in mass + 2 × % error in velocity

= 2 + 2 × 3 = 8 %

18. (c)

$v = 2n\ (\ell_2 - \ell_1)$

$\Delta v = 2n\ (\Delta\ell_2 + \Delta\ell_1)$

= 2 × 512 × (0.1 + 0.1) = 204.8 cm/sec.

19. (a)

mass = $\sqrt{10 \times 11}$ = 10.48

20. (b)

pitch = 2/4

LC = $\frac{2/4}{50}$ = .01 mm

diameter = 3 × 0.5 + 32 × .01

= 1.5 + .32

= 1.82 mm

21. (c)

$M = \sqrt{M_1 M_2}$

$M = \sqrt{24.2 \times 20} = \sqrt{484} = 22$ g

22. (b)

$M = \frac{M_1 + M_2}{2}$

$M = \frac{7.00 + 7.50}{2} = 7.25$ kg.

23. (c)

VC = $\frac{1}{50}$ × (value of 1 MSD)

$= \frac{1}{50} \times \frac{1}{20} = 0.001$ cm

24. (a)

Least count = 0.001 cm

Zero Error = – (2 × 0.001)

= – 0.002 cm = –0.02 mm

25. (b)

$e = \frac{\ell_2 - 3\ell_1}{2} = \frac{32 - 3 \times 10}{2} = 1$ cm

26. (a)

$m = \frac{8+18}{2} = \frac{26}{2} = 13$ kg

27. (a)

e = 13 × 0.01 = 13 mm

28. (c)

$M = \frac{M_1 + M_2}{2} = \frac{10.30 + 12.62}{2} = 11.46$ g

29. (a)

2 + 0.57 – 0.04 = 2.53 mn

30. (c)

41 + 4 × 0.1 – 0.8 = 40.6 mm = 4.06 cm