



Date - 16.06.20

Topic – Error calculation

Choose the correct option for the following questions.

Chapter - Units, Dimension & Error Analysis

 $1 \times 15 = 15$ 

- 1. The length of a rod is measured by five students as 4.9cm, 4.9cm, 5.0cm, 5.1cm and 5.1cm. The mean absolute error in this measurement is
  - a. 0 cm

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- b. 0.08 cm
- c. 0.1 cm
- d. 0.016 cm
  - Ans: b. 0.08cm
- 2. The relative error in the above case is
  - a. 0 cm
  - b. 0.08 cm
  - c. 0.1 cm
  - d. 0.016 cm
    - Ans: d. 0.016cm

3. While measuring the radius of a sphere, five students record it as 3cm, 3.01cm, 2.99cm, 2.99cm and 3.01cm. what will be the absolute error in the measurement of its volume ?

- a.  $0.7 \ cm^3$
- b.  $0.8 \ cm^3$
- c.  $0.9 \ cm^3$
- d.  $1.0 \ cm^3$

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Ans: c. 0.9 cm<sup>3</sup>
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- 4. In the above case what will be the percentage error?
  - a. 0.8 %
  - b. 0.5 %
  - c. 0.4 %
  - d. 8%

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Ans: a. 0.8 %
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- 5. Two resistors are connected in series with values  $(5 \pm 0.05) \Omega$  and  $(3 \pm 0.3)\Omega$ . What will the equivalent resistance of this combination with error estimation?
  - a.  $(8 \pm 0.08) \Omega$
  - b.  $(8 \pm 0.35) \Omega$
  - c.  $(2 \pm 0.08) \Omega$
  - d.  $(2 \pm 0.35) \Omega$ 
    - Ans: b.  $(8 \pm 0.35) \Omega$
- 6. In the above case, what will be the percentage error?
  - a. 0.4375 %
  - b. 4.735 %
  - c. 4.375 %
  - d. None of these Ans: c. 4.375 %

- 7. Percentage error in the measurement of mass and speed are 2% and 3% respectively. The error in the estimate of kinetic energy obtained by measuring mass and speed will be
  - a. 12%
  - b. 10%
  - c. 8%
  - d. 2%
    - Ans: c. 8%
- 8. The density of a cube is measured by measuring its mass and length of one side. 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. 7%
  - b. 9%
  - c. 12%
  - d. 13%
    - Ans: d. 13%
- 9. 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 error in pressure?
  - a. 8%
  - b. 6%
  - c. 4%
  - d. 2%

Ans: a. 8%

- 10. By what percentage should the pressure of a given mass of gas be increased, so as to decrease its volume by 10% at a constant temperature?
  - a. 11.1%
  - b. 10.1%
  - c. 9.1%
  - d. 8.1%

## Ans: a. 11.1%

- 11. If momentum of a particle is increased by 100%, then percentage increase in its kinetic energy will be
  - a. 400%
  - b. 300%
  - c. 100%
  - d. 200%
    - Ans: b. 300%
- 12. If the error introduced to measure the resistance, current and time are 1%, 2% and 1% respectively, then the maximum error in the calculation of heat produced due to the flow of current is
  - a. 8%
  - b. 6%
  - c. 18%
  - d. 12%
    - Ans: b. 6%
- 13. The length and breadth of a rectangular plane is given as,  $l = (20 \pm 0.2)cm$  and  $b = (10 \pm 0.1)cm$ . If the area is determined by this data, then the mean absolute error in measurement of area will be
  - a.  $0.02 m^2$
  - b.  $0.01m^2$
  - c. 2*m*<sup>2</sup>
  - d.  $4m^2$ 
    - Ans: d. 4*m*<sup>2</sup>

- 14. A physical quantity P is calculated by measuring *a*, *b*, *c* and *d* with the help of the relation  $P = \frac{a^3b^2}{\sqrt{c} d}$ . If the error introduced in the measurement of *a*, *b*, *c* & *d* are 1%, 3%, 4% and 2% respectively, then wjat will be percentage error in the calculation of P?
  - a. 1.3 %
  - b. 13%
  - c. 3.1%
  - d. 31%
    - Ans: b. 13%

15. The acceleration due to gravity g is calculated with the help of simple pendulum by measuring the length of thread of the pendulum l and the time period of oscillation T, where  $T = 2\pi \sqrt{\frac{l}{g}}$ . If the measured value of l is 20cm with an error of 1mm and the measured value of T is 90 s with an error of 1s, then the percentage error in the calculation of g is –

- a. 0.027 %
- b. 0.27 %
- c. 2.7 %
- d. 27%

Ans: c. 2.7 %

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