Units and Measurement

Case Study Based Questions

Read the following passages and answer the questions that follow:

1. Measurement is one subject matter which isn't always best taught in math however additionally in Physics and Chemistry due to the fact that each problem calls for the information of size, so that it will degree the quantities. Measuring a amount does now no longer continually provide a superbly correct answer. Only Ideal measuring gadgets can offer a superbly correct answer. Practically size results in elements of a solution known as dependable digits and unsure digits. The reliability of a size is indicated via way of means of the variety of digits used to symbolize it. To specific it extra correctly we specific it with digits which are recognized with certainty. These are known as large figures. They incorporate all of the positive digits plus one dubious digit in a variety.
(A) Give any three rules of significant figures.
(B) Find the total number of significant digits in 5400.
(C) What is the rounded off value of 1.6932?

Ans. (A) (1) All non-zero digits are significant.
(2) All zeroes between two non-zero digits are significant.
(3) All zeroes occurring between the decimal point and the non-zero digits are not significant, provided there is only a zero to the left of the decimal point.
(B) There are 2 significant figure in 5400 because as we know if there is zero at the end of any number without decimal point, should be considered as non-significant figure.
(C) The rounding off value of given no. 1.7 because according to the rule of rounding off if the digit to be dropped is more than 5, then the preceding digit is raised by 1.

2. A mathematical calculation can't increase the precision of a physical measurement therefore the number of significant figures in the sum or product of a group of measurement cannot be greater than minimum number of significant figures.
(A) A car runs 1200 m in 22.5 sec. The average speed of a car in appropriate significant figures.
(a) 53.3 m/s
(b) 53.33 m/s
(c) 53.333 m/s

(d) None of these

(B) The radius of a uniform wire r = 0.024 cm. Take л= 3.142, then area of cross-section upto appropriate significant figures.

(a) 0.001808 cm^2

(b) 0.0018086 cm^2

(d) 18.08 cm^2

(c) 0.0018 cm^2

(C) The volume of sphere is 2.42 cm^3. The volume of 12 spheres taking into account the significant figures.

(a) 29.0 cm^3

(b) 29.04 cm^3

(c) 29.1 cm^3

(d) 29 cm^3

(D) The length of a rectangular block is 2.5 m, breadth is 1.75 m. The area of surface of block taking into account of the significant figures.

(a) 4.38 cm^2

(b) 4.3 cm^2

(c) 4.4 cm^2

(d) 4.375 cm^2

(E) The number of significant figures in 0.06900 is.....

(a) 5

(b) 4

(c) 2

(d) 3

Ans. (A) (a) 53.3 m/s

Explanation: Given that:

Distance = 1200 m

Time = 22.5 sec

Average speed = ?

We know that:

$$\text{Average speed} = \frac{\text{Total Distance}}{\text{Total Time Taken}}$$

Hence,

$$S = \frac{1200}{22.5}$$

$$= 53.333333 \text{ m/s}$$

In significant figure, the average speed is 53.3 m/s.

(B) (c) 0.0018 cm^2

Explanation: According to the question:

r = 0.024 cm

As we know that,

π = 3.142

Area of Cross-Section of wire = Tr^2

A = 3.142 x 0.024 × 0.024

= 0.001809792 cm^2

So, the value of the area of cross-section in significant figure is 0.0018 cm^2.

(C) (d) 29 cm^3

Explanation: Given that:

Volume of sphere = 2.42 cm^3

There are 12 spheres.

So, Total volume = 12 x 2.42

= 29.04 cm^3

Hence, the value of the total volume in significant figures is 29 cm^3.

(D) (a) 4.38 cm^2

Explanation: Given that:

Length of block, l = 2.5 m

Breadth of block, b = 1.75 m

As we know that,

Area of rectangular block = lxb

= 2.5 x 1.75

= 4.375 cm^2

Hence, the value of the area in significant figures is 4.38 cm^2.

(E) (b) 4

Explanation: According to the rule of significant figure, all zeroes occurring between the decimal point and the non- zero digits are not significant, provided there is only a zero to the left of the decimal point. So, the value 0.06900 has 4 significant figures.