QB365 Question Bank Software Study Materials

Nature of Physical World and Measurement Important 2 Marks Questions With Answers (Book Back and Creative)

11th Standard

Physics

Total Marks : 60

2 Marks

30 x 2 = 60

1) Write the rules for determining significant figures.

Answer :

Rule	Example
(i) All non-zero digits are significant	1342 has four significant figures
(ii) All zeros between two non zero digits are significant	2008 has four significant figures
(iii) All zeros to the right of a non-zero digit but to the left of a decimal point are significant.	30700 has five significant figures
(iv) a) The number without a decimal point, the terminal or trailing zero(s) are not significant.	30700 has three significant figures
b) All zeros are significant if they come from a measurement	30700 has three significant figures
(v) If the number is less than 1, the zero (s) on the right of the decimal point but to left of the first non zero digit are not significant.	0.00345 has three significant figures
(vi) All zeros to the right of a decimal point and to the right of non-zero digit are significant.	40.00 has four significant figures and 0.030400 has five significant figures
(vii) The number of significant figures does not depend on the system of units used	1.53 cm, 0.0153 m, 0.0000153 km, all have three significant figures.

2) Define precision and accuracy. Explain with one example.

Answer : Precision refer to the closeness of two or more measurements to each other. Precision is a measure of the detail in which a quantity is expressed. Precision is independent of accuracy.

Precision is the quantity or state of being precise exactness. It is the degree of refinement with which an operation is performed or a measurement stated. Precision refers to the resolution or the limit to which the quantity is measured. It is determined by the least count of the measuring instrument.

Example:

(1) If you weigh a given substance five times, and get 2.7 kg each time then your measurement is very precise.

(2) If the temperature outside a building is 40°C as measured by a weather thermometer and if the real outside temperature is 40°C, then the thermometer is accurate. If the thermometer consistantly registers this exact temperature in arrow the

thermometer is precise.

Accuracy of a measurement is a measure of how close the measured value is the true value of the quantity. A measurement system can be accurate but not precise, precise but not accurate neither, or both.

Example:

If an experiment containing a systematic error then increasing the sample size generally increases precision but does not improve accuracy.

If a measurement is precise, that does not necessarily mean that it is accurate. However, if the measurement is consistantly accurate, it is also precise.

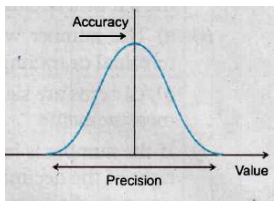
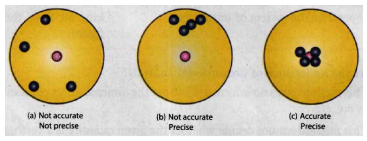


Illustration: Target shooting is an example which explains the difference between accuracy and precision. In Figure, the shots are focused so as to reach the bull's eye (midpoint), but the arrows have reached only around this point. Hence the shots are not accurate and also not precise.

In Figure (b), all the shots are close to each other but not at the central point. Hence the shots are said to be precise but not accurate. In Figure (c), the shots are closer and also at the central point. Hence the shots are both precise and accurate.



3) Write short notes on the following.

(a) Unit

Answer : **(a) Unit:** An arbitrarily chosen standard of measurement of a quantity, which is accepted internationally is called unit of the quantity.

4) The radius of the circle is 3.12 m. Calculate the area of the circle with regard to significant figures.

Answer : Radius of the circle r = 3.12 m

Area of the circle A = π r^2

= $3.14 \times 3.12 \times 3.12$

= 30.566016 m^2

According to the rule of significant

A = 30.6 m^2

5) The measurement value of length of a simple pendulum is 20cm known with 2mm accuracy. The time for 50 oscillations was measured to be 40 s within is resolution. Calculate the percentage accuracy in the determination of acceleration due to gravity 'g' from the above measurement.

Answer : Length of a simple pendulum $l = 20 \text{ cm} = 20 \times 10^{-2} \text{ m}$

$\text{Accuracy } = 2 \text{ mm} = 2 \times 10^{-3} \text{ m}$

Time for one oscillation $= \frac{40}{50} = 0.88$

$T = 2\pi\sqrt{\frac{l}{g}}; T^2 = 4\pi^2 \left(\frac{l}{g}\right)$

$g = \frac{4\pi^2 l}{T^2}$

$\frac{\Delta g}{g} \times 100 == \frac{\Delta l}{l} \times 100 + 2\frac{\Delta T}{T} \times 100$

$l = 20 \text{ cm} \Delta l = 2 \text{ mm} = 0.2 \text{ cm} \Delta T = 1 \text{ s}$

$\frac{\Delta g}{g} = \frac{\Delta l}{l} + 2\frac{\Delta T}{T}$

$= \frac{0.2}{20} + 2 \times \frac{1}{40}$

= 0.01 + 0.05 = 0.06

∴ Percentage accuracy in the determination of g=0.06 x 100=6 %

6) A RADAR signal is beamed towards a planet and its echo is received 7 minutes later. If the distance between the planet and the Earth is 6.3×10^{10} m. Calculate the speed of the signal?

Answer : The distance of the planet from the Earth

d = 6.3×10^{10} m

Time t = 7 minutes = 7×60 s.

The speed of signal v = ?

The speed of signal v = $\frac{2d}{t} = \frac{2 \times 6.3 \times 10^8}{7 \times 60} = 3 \times 10^8 ms^{-1}$

7) Check the correctness of the equation $\frac{1}{2}mv^2 = mgh$ using dimensional analysis method.

Answer : Dimension formula for

$\frac{1}{2}mv^2 = [M][LT^{-1}]^2 = [ML^2T^{-2}]$

Dimension formula for

$mgh = [M][LT^{-2}][L] = [ML^2T^{-2}]$

$[ML^2T^{-2}] = [ML^2T^{-2}]$

Both sides are dimensionally the same, hence the equations $\frac{1}{2}mv^2 = mgh$ is dimensionally correct

8) A physical quantity x is given by $x = \frac{a^2b^3}{c\sqrt{d}}$. If the percentage errors of measurement in a,b, c and d are 4%, 2%, 3% and 1% respectively, then calculate the percentage error in the calculation of x.

Answer : Given $x = \frac{a^2b^3}{c\sqrt{d}}$

The percentage error in x is given by

$\frac{\triangle x}{x} \times 100 = 2\frac{\triangle a}{a} \times 100 + 3\frac{\triangle b}{b} \times 100 + \frac{\triangle c}{c} \times 100 + \frac{1}{2}\frac{\triangle d}{d} \times 100$

= (2×4%)+(3×2%)+(1×3%)+(1\2 × 1%)

=8% + 6% + 3% + 0.5%

The percentage error is x = 17.5%

9) State the number of significant figures in the following 400

Answer : one

10) State the number of significant figures in the following 5213.0

Answer : five

11) State the number of significant figures in the following 2.65×10^{24}m

Answer : three

12) State the number of significant figures in the following 0.0006032

Answer : four

13) Round off the following numbers as indicated 19.45 up to 3 digits

Answer : 19.4

14) Round off the following numbers as indicated 101.55×10^6 up to 4 digits

Answer : 101.6×10^6

15) Round off the following numbers as indicated 248337 up to digits 3 digits

Answer : 248000

16) Round off the following numbers as indicated 12.653 up to 3 digits.

Answer : 12.7

17) Convert 76 cm of mercury pressure into Nm^{-2} using the method of dimensions.

Answer : In cgs system 76 cm of mercury pressure = 76×13.6×980 dyne cm^{-2}

The dimensional formula of pressure P is $[ML^{-1}T^{-2}]$; so $P_1 [M_1^a L_1^b T_1^c] = P_2[M_2^a L_2^b T_2^c]$

We have $P_2 = P_1 \left[\frac{M_1}{M_2}\right]^a \left[\frac{L_1}{2}\right]^b \left[\frac{T_1}{T_2}\right]^c$

M_1 = 1g, M_2 =1kg

L_1 = 1 cm, L_2 = 1m

T_1 = 1 s, T_2 = 1s

So, a = 1, b = -1, and c =-2

Then, $P_1 = 76 \times 13.6 \times 980$

$\left[\frac{1g}{1kg}\right]^1 \left[\frac{1cm}{1m}\right]^{-1} \left[\frac{1s}{1s}\right]^{-1} = 76 \times 13.6 \times 980 \left[\frac{10^{-3}kg}{1kg}\right]^1 \left[\frac{10^{-2}m}{1m}\right]^{-1} \left[\frac{1s}{1s}\right]^{-2}$

$= 76 \times 13.6 \times 980 \times [10^{-3}] \times 10^2$

$P_2 = 1.01 \times 10^5$ Nm^{-2}

18) Jupiter is at a distance of 824. 7 million km from the earth, its angular diameter is measured to be 35.72^0 of arc. Calculate diameter of Jupiter.

Answer : Distance of Jupiter $x = 824.7 \times 10^6$ km

Angular diameter $Q = 35.72''$

$1'' = 4.85 \times 10^{-6}$rad

$Q = 35.72 \times \left(4.85 \times 10^{-6}\right)$ rad

$= 173.242 \times 10^{-6}$rad

$x = \frac{b}{Q}$

Diameter of Jupiter b = x $\times$ Q

b = 824.7 x 10^6 x 173.242 x 10^{-6}

= 142,872.6 x 10^{6-6}

= 1.428 x 10^5 km

19) Write short notes on the following.

(b) Rounding - off

Answer : **(b) Rounding-off:** The result given by a calculator has too many figures. In no case should the result have more significant figures than the figures involved in the data used for calculation.

The result of calculation with numbers containing more than one uncertain digit should be rounded off. By following the rules for rounding off a value, we can get the most accurate value of a measured quantity. This procedure is known as rounding off.

20) Write short notes on the following.

(c) Dimensionless quantities

Answer : **(c) Dimensionless quantities:** Quantities that have constant values and also have no dimensions are called dimension less constants. **Examples are:** π , e, numbers etc.

21) What is Leap year?

Answer : The year which is divisible by 4 and in which the month of February has 29 days is called Leap year.

22) What is the importance of physical quantity? What are its types

Answer : (i) To understand the properties of material, measurement of physical quantities are involved.

(ii) It is classified into fundamental physical quantity and derived physical quantity

23) What is an error? Name the three Errors in Measurement.

Answer : The uncertainty in a measurement is called an error.

The three possible errors are

(i) Systematic errors

(ii) Random errors

(iii) Gross errors

24) Define the SI unit of electric current.

Answer : "ampere" is the SI unit of electric current. One ampere is the constant current, which when maintained in each of the two straight parallel conductors of infinite length and negligible cross section, held one metre apart in vacuum shall produce a force per unit length of 2×10^{-7} N/m between them.

25) Why is the cylinder used in defining kilogram made up of platinum-iridium alloy?

Answer : This is because the platinum-iridium alloy is least affected by environment and time.

26) If a mass of a proton is 1.67×10^{-27} kg, how many protons will be present in 1 kg?

Given data:

Mass of a proton = 1.67×10^{-27} kg

1.67×10^{-27} kg is mass of 1 proton.

Answer : 1 kg is the mass of $\frac{1}{1.67\times10^{-27}}$ protons

= 0.5988×10^{27} protons

= $5.988\times\ 10^{26}$ protons

5.9888×10^{26} protons will be present in 1 kg.

27) Name the main branches of physics

Answer : Classical and Modem is the main branches of physics.

28) What is acoustics?

Answer : The study of the production and propagation of sound waves

29) Add 7.21, 12.141 and 0.0028 and express the result to an appropriate number of significant figures.

Answer : 7.21 + 12.141 + 0.0028 = 19.3538

Corrected sum = 19.35 (Rounded off upto 2 decimal place)

Here 7.21 has minimum number of decimal places (two), so result is rounded off upto second place of decimal point.

30) What is the difference between mN, Nm and nm ?

Answer : mN means milli newton, 1 mN = 10^{-3} N, Nm means Newton meter, nm means nano meter.