PHYSICS

BOOKS - ICSE

MEASUREMENTS AND EXPERIMENTATION

Examples

1. The mass of an atom of oxygen is 16.0 u. Express it in kg.

2. The mass of a molecule of hydrogen is 3.332×10^{-27} kg. Find the mass of 1 kg mol of hydrogen gas.

3. The size of a particle is 4.6μ . Express it in metre.

4. It takes 5 years for light to reach the earth from a star. Express the distance of star from the earth in (i) light year, (ii) km . Take speed of light $= 3 \times 10^8 ms^{-1}$ and $1 year = 3.153 \times 10^7$ s

5. The average mass of an atom of uranium is 3.9×10^{-25} kg. Find the number of atom is 1 g of uranium.

6. The wavelength of light is 5000 Å , express it in nm .

**7.** The wavelength of light is 5000 Å , express it in m .

8. In an instrument, there are 25 divisions on the vernier scale which have length of 24 divisions of the main scale. 1 cm on main scale is divided in 20 equal parts. Find the least count.

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9. Fig. given below shows the two scales of a vernier callipers. Find : (i) the least count of the vernier , and (ii) the reading shown in the

diagram.

MAIN SCALE

12   13   cm

0   5   10
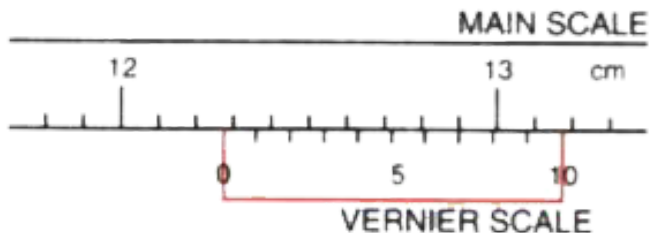
VERNIER SCALE

10. The least count of a vernier callipers is 0.01 cm and its zero error is + 0.02 cm. While measuring the length of a rod, the main scale reading is 4.8 cm and sixth division on vernier

scale is in line with a marking on the main scale. Calculate the length of the rod.

11. The circular head of a screw gauge is divided into 50 divisions and the screw moves 1 mm ahead in two revolutions of the circular head. Find its pitch .

12. The circular head of a screw gauge is divided into 50 divisions and the screw moves 1 mm ahead in two revolutions of the circular head. Find its least count.

13. The pitch of a screw gauge is 1 mm and there are 100 divisions on the circular head. While measuring the diameter of a wire, the main scale reads 3 mm and the 55th division is
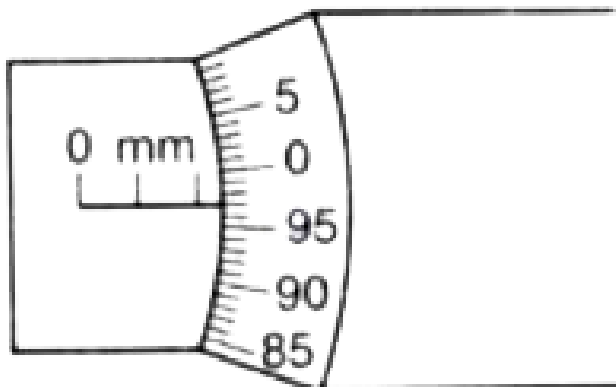
in line with the base line. Find the diameter of the wire. Assume that the screw gauge is free from zero error.

14. In Fig. the pitch of the screw is 1 mm. Find :

(i) the least count of screw gauge and (ii) the

reading represented in the diagram.

15. A boy measures the length of a piece of

pencil by metre rule, vernier callipers and

screw gauge to be 1.2 cm, 1.24 cm and 1.243 cm

respectively. State the least count of each measuring instrument

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16. A boy measures the length of a piece of pencil by metre rule, vernier callipers and screw gauge to be 1.2 cm, 1.24 cm and 1.243 cm respectively. State the accuracy in each measurement .

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17. Calculate the length of a seconds' pendulum at a place where $g = 9.8ms^{-2}$

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18. Compare the time periods of a simple pendulum at places where g is $9.8ms^{-2}$ and 4.36 m s^{-2} respectively .

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19. Compare the time periods of two simple pendulums of length 1 m and 16 m at at place.

20. (a) A simple pendulum is made by suspending a bob of mass 500 g by a string of length 1 m . Calculate its time period at a place where g = 10 ms^{-2} .

(b) How will the time period in part (a) the

affected if bob of mass 100 g is used, keeping the length of string unchanged ?

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Exercise 1 A

1. What is meant by measurement ?

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2. What do you understand by the term unit?

3. What are the three requirements for selecting a unit of a physical quantity ?

4. Name the three fundamental quantities.

5. Name the three systems of unit and state the various fundamental units in them.

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6. Define a fundamental unit.

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7. What are the fundamental units in S.I. system ? Name them along with their symbols.

8. Explain the meaning of derived unit with the

help of one example.

9. Define standard metre.

10. Name two units of length which are bigger than a meter. How are they related to the unit meter?

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11. Write the names of two units of length smaller than a metre. Express their relationship with metre.

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12. How is nanometre related to Angstrom ?

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13. Name the three convenient units used to measure length ranging from very short to very long value. How are they related to the S.I. unit?

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14. Name the S.I. unit of mass and define it.

15. Complete the following:

1 light year = …….. M

16. Complete the following:

1 m = ………….. Å

17. Complete the following:

$1 \, m = \, ... \, \mu$

18. Complete the following:

$1 \, micron = \, ... \, \mathring{A}$

19. Complete the following:

1 fermi = ... M

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20. State two units of mass smaller than a kilogram. How are they related to the unit Kilogram?

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21. State two units of mass bigger than a kilogram. Give their relationship with the kilogram.

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22. Complete the following:

1g = ... Kg

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23. Complete the following:

1 mg = ... Kg

24. Complete the following:

1 quintal = ... Kg

25. Complete the following:

1 a.m.u (or u) = ...

26. Name the S.I. unit of time and define it.

27. Name two units of time bigger than a second. How are they related to second ?

28. What is a leap year?

29. The year 2020 will have February of 29 days'. Is this statement true ?

30. What is a lunar month?

31. Complete the following:

1 nano second = ... S

32. Complete the following:

μs = ... S.

33. Complete the following:

1 mean solar day = ... s.

34. Complete the following:

1 year = ... s

35. Name the physical quantities which are measured in the following unit

u

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36. Name the physical quantities which are measured in the following unit

ly

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37. Name the physical quantities which are measured in the following unit

ns

▶ **Watch Video Solution**

38. Name the physical quantities which are measured in the following unit

nm

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39. Write the derived units of the following

speed

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40. Write the derived units of the following

force

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41. Write the derived units of the following

work

42. Write the derived units of the following

pressure

43. How are the following derived units related to the fundamental units ?

newton

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44. How are the following derived units related to the fundamental units ?

watt

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45. How are the following derived units related to the fundamental units ?

(a)Newton , (b)Watt , (c) Joule , (d) Pascal

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46. How are the following derived units related to the fundamental units ?

pascal

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47. Name the physical quantities related to the following unit :

km^2

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48. Name the physical quantities related to the following unit :

newton

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49. Name the physical quantities related to the following unit :

joule

50. Name the physical quantities related to the following unit :

pascal

51. Name the physical quantities related to the following unit :

watt

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Exercise 1 A Multiple Choice Type

1. The fundamental unit is :

A. newton

B. pascal

C. hertz

D. second

Answer: D

2. Which of the following unit is not a fundamental unit:

A. metre

B. litre

C. second

D. kilogram

Answer: B

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3. The unit of time is :

A. light year

B. parsec

C. leap year

D. angstrom

Answer: C

4. 1 Å is equal to :

A. 0.1 nm

B. 10^{-10} cm

C. $10^{-8} m$

D. $10^{-4} \mu$

Answer: A

5. ly is the unit of :

    A. time

    B. length

    C. mass

    D. none of these

Answer: B

Exercise 1 A Numerical

1. The wavelength of light of a particular colour is 5800 Å. Express it in.

(i) nanometre and (ii)metre

2. The wavelength of light of a particular colour is 5800 Å. Express it in.

(i) nanometre and (ii)metre

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3. If the size of bacteria is 1 micron, what will be the number of it in 1 m length?

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4. The distance of a galaxy from the earth is 5.6×10^{25} m. Assuming the speed of light to be 3×10^8 m s^{-1} find the time taken by light to travel this distance.

5. The wavelength of light is 589 nm. What is its wavelength in Å ?

6. The mass of an atom of oxygen is 16.0 u. Express it in kg.

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7. It takes time 8 min for light to reach from the sun to the earth surface. If speed of light is taken to be 3×10^8 m s^{-1}, find the distance from the sun to the earth in km.

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8. The distance of a star from the earth is 8.33 light minutes.' What do you mean by this statement ? Express the distance in metre.

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Exercise 1 B

1. Explain the meaning of the term 'least count of an instrument' by taking a suitable example.

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2. A boy makes a ruler with graduations in cm on it (i.e., 100 divisions in 1 m). To what accuracy this ruler can measure ? How can this accuracy be increased ?

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3. A boy measures the length of a pencil and expresses it to be 2.6 cm. What is the accuracy of his measurement ? Can he write it as 2.60 cm ?

4. Define least count of a vernier callipers. How do you determine it?

5. Define the term 'Vernier constant'.

6. When is a vernier callipers said to be free from zero error?

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7. What is meant by zero error of a vernier callipers ? How is it determined ? Draw neat diagrams to explain it. How is it taken in account to get the correct measurement ?

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8. A vernier callipers has a zero error + 0.06 cm. Draw a neat labelled diagram to represent it.

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9. Draw a neat labelled diagram of a vernier callipers.

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10. State three uses of a vernier callipers.

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11. Name the two scales of a vernier callipers and explain, how it is used to measure a length correct up to 0.01 cm.

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12. Describe in steps, how would you use a vernier callipers to measure the length of a small rod ?

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13. Name the part of the vernier callipers which is used to measure the following external diameter of a tube

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14. Name the part of the vernier callipers which is used to measure the following internal diameter of a mug

▶ **Watch Video Solution**

15. Name the part of the vernier callipers which is used to measure the following depth of a small bottle,

▶ **Watch Video Solution**

16. Name the part of the vernier callipers which is used to measure the following thickness of a pencil.

17. Explain the term pitch. How are they determined ?

18. Explain the term least count of a screw gauge. How are they determined ?

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19. How can the least count of a screw gauge be decreased ?

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20. Draw a neat and labelled diagram of a screw gauge. Name its main parts and state their functions.

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21. State one use of a screw gauge .

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22. State the purpose of ratchet in a screw gauge.

23. What do you mean by zero error of a screw gauge ? How is it accounted for ?

24. A screw gauge has a least count 0.001 cm and zero error + 0.007 cm. Draw a neat diagram to represent it.

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25. What is backlash error ? Why is it caused ?

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26. The diameter of a thin wire can be measured by :

27. Name the instrument which can measure accurately the following

the diameter of a needle

28. Name the instrument which can measure accurately the following

the thickness of a paper

29. Name the instrument which can measure accurately the following

the internal diameter of the neck of a water bottle

30. Name the instrument which can measure accurately the following

the diameter of a pencil.

31. Which of the following measures a small length to a high accuracy: metre rule, vernier callipers, screw gauge ?

32. Name the instrument which has the least count 0.1 mm .

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33. Name the instrument which has the least count 1 mm .

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34. Name the instrument which has the least count 0.01 mm.

Exercise 1 B Multiple Choice Type

1. The least count of a vernier callipers is :

    A. 1 cm

    B. 0.001 cm

C. 0.1 cm

D. 0.01 cm

Answer: C

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2. A microscope has its main scale with 20 divisions in 1 cm and vernier scale with 25 divisions, the length of which is equal to the length of 24 divisions of main scale. The least count of microscope is :

A. 0.002 cm

B. 0.001 cm

C. 0.02 cm

D. 0.01 cm

Answer: A

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3. The diameter of a thin wire can be measured

by :

A. a vernier callipers

B. a metre rule

C. a screw gauge

D. none of these.

Answer: C

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Exercise 1 B Numericals

1. A stop watch has 10 divisions graduated between the 0 and 5 s marks. What is its least count?

2. A vernier has 10 divisions and they are equal to 9 divisions of main scale in length. If the main scale is calibrated in mm, what is its least count?

3. A microsocpe is provided with a main scale graduated with 20 divisions in 1 cm and a vernier scale with 50 divisions on it of length same as of 49 divisions of main scale. Find the least count of the microscope.

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4. A boy uses a vernier callipers to measure the thickness of his pencil. He measures it to be 1.4 mm. If the zero error of vernier callipers

is + 0.02 cm, what is the correct thickness of pencil ?

5. A vernier callipers has its main scale graduated in mm and 10 divisions on its vernier scale are equal in length to 9 mm. When the two jaws are in contact, the zero of vernier scale is ahead of zero of main scale and 3rd division of vernier scale coincides with a main scale division. Find the least count .

6. A vernier callipers has its main scale graduated in mm and 10 divisions on its vernier scale are equal in length to 9 mm. When the two jaws are in contact, the zero of vernier scale is ahead of zero of main scale and 3rd division of vernier scale coincides with a main scale division. Find the zero error of vernier callipers.

7. The main scale of a vernier callipers is calibrated in mm and 19 divisions of main scale are equal in length to 20 divisions of vernier scale. In measuring the diameter of a cylinder by this instrument, the main scale reads 35 divisions and the 4th division of vernier scale coincides with a main scale division. Find least count .

8. The main scale of a vernier callipers is calibrated in mm and 19 divisions of main scale are equal in length to 20 divisions of vernier scale. In measuring the diameter of a cylinder by this instrument, the main scale reads 35 divisions and the 4th division of vernier scale coincides with a main scale division. Find radius of cylinder.

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9. In a vernier callipers, there are 10 divisions on the vernier scale and 1 cm on the main scale is divided in 10 parts. While measuring a length, the zero of the vernier lies just ahead of 1.8 cm mark and 4th division of vernier coincides with a main scale division FInd the length.

10. In a vernier callipers, there are 10 divisions on the vernier scale and 1 cm on the main scale is divided in 10 parts. While measuring a length, the zero of the vernier lies just ahead of 1.8 cm mark and 4th division of vernier coincides with a main scale division . If zero error of vernier callipers is -0.02 cm, what is the correct length ?

11. The pitch of a screw gauge is 0.5 mm and the head scale is divided in 100 parts. What is the least count of screw gauge ?

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12. The circular head of a screw gauge is divided into 50 divisions and the screw moves 1 mm ahead in two revolutions of the circular head. Find its pitch .

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13. The circular head of a screw gauge is divided into 50 divisions and the screw moves 1 mm ahead in two revolutions of the circular head. Find its least count.

14. The pitch of a screw gauge is 1 mm and its circular scale has 100 divisions. In measurement of the diameter of a wire, the main scale reads 2 mm and 45th mark on

circular scale coincides with the base line. Find the least count .

15. The pitch of a screw gauge is 1 mm and its circular scale has 100 divisions. In measurement of the diameter of a wire, the main scale reads 2 mm and 45th mark on circular scale coincides with the base line. Find the diameter of the wire.

16. When a screw gauge of least count 0.01 mm is used to measure the diameter of a wire, the reading on the sleeve is found to be 1 mm and the reading on the thimble is found to be 27 divisions.What is the diameter of the wire in cm ?

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17. When a screw gauge of least count 0.01 mm is used to measure the diameter of a wire, the

reading on the sleeve is found to be 1 mm and the reading on the thimble is found to be 27 divisions.If the zero error + 0.005 cm, what is the correct diameter ?

18. A screw gauge has 50 divisions on its circular scale and its screw moves by 1 mm on turning it by two rotations. When the flat end of the screw is in contact with the stud, the zero of circular scale lies below the base line

and 4th division of circular scale is in line with the base line. Find the pitch.

19. A screw gauge has 50 divisions on its circular scale and its screw moves by 1 mm on turning it by two rotations. When the flat end of the screw is in contact with the stud, the zero of circular scale lies below the base line and 4th division of circular scale is in line with the base line. Find the least count .

20. A screw gauge has 50 divisions on its circular scale and its screw moves by 1 mm on turning it by two rotations. When the flat end of the screw is in contact with the stud, the zero of circular scale lies below the base line and 4th division of circular scale is in line with the base line. Find the zero error, of the screw gauge.

21. Fig. below shows the reading obtained while measuring the diameter of a wire with a screw gauge. The screw advances by 1 division on main scale when circular head is rotated once.
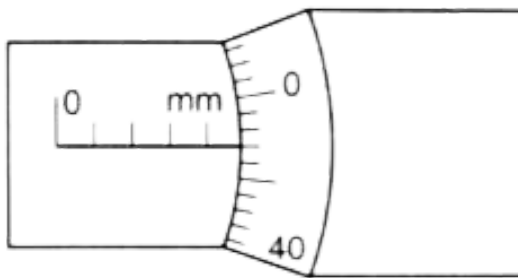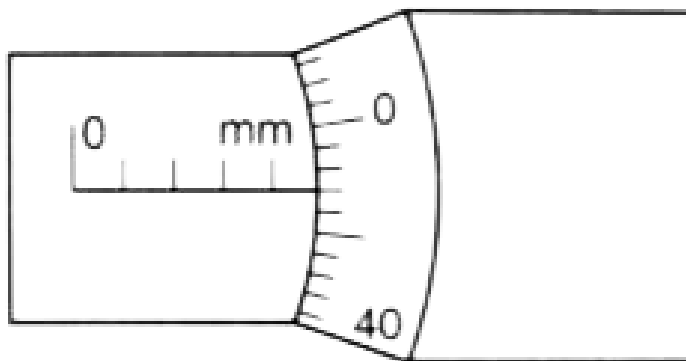

Find least count of screw gauge .

22. Fig. below shows the reading obtained while measuring the diameter of a wire with a screw gauge. The screw advances by 1 division on main scale when circular head is rotated once.
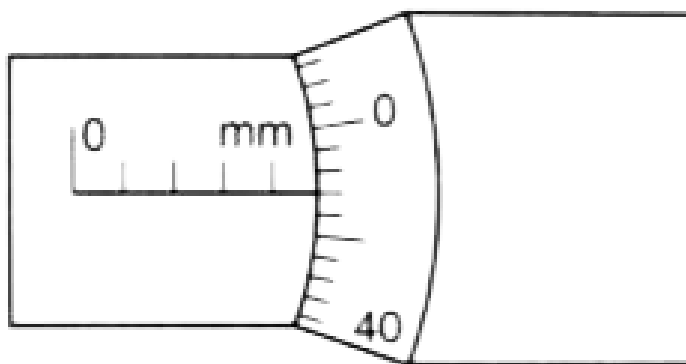

Find the diameter of the wire.

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23. Fig. below shows the reading obtained while measuring the diameter of a wire with a screw gauge. The screw advances by 1 division on main scale when circular head is rotated once.

Find the diameter of the wire.

1. What is a simple pendulum ? Is the pendulum used in a pendulum clock simple pendulum ? Give reason to your answer.

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2. Define the term oscillation

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3. Define the term amplitude of a wave. Write

its S.I. unit.

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4. Define the term frequency .

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5. Define the term time period as related to a

simple pendulum.

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6. Draw a neat diagram of a simple pendulum. Show on it the effective length of the pendulum and its one oscillation.

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7. Name two factors on which the time period of a simple pendulum depends. Write the relation for the time period in terms of the above named factors.

8. Name two factors on which the time period

of a simple pendulum does not depend.

9. How is the time period of a simple

pendulum affected, if at all, in the following

situation

the length is made four times.

10. How is the time period of a simple pendulum affected, if at all, in the following situations: The acceleration due to gravity is reduced to one-fourth

11. What is the relation between time period (T) and frequency (f) of an oscillation of a simple pendulum?

12. How do you measure the time period of a given pendulum? Why do you note the time for more than one oscillation?

13. How does the time period (T) of a simple pendulum depend on its length (l)? Draw a graph showing the variation of T_2 with l. How

will you use this graph to determine the value of g (acceleration due to gravity) ?

14. Two simple pendulums A and B have equal lengths, but their bobs weigh 50 gm and 100 gm, respectively. What would be the ratio of their time periods? Give reasons for your answer.

15. Two simple pendulums A and B have lengths 1.0 m and 4.0 m respectively at a certain place. Which pendulum will make more oscillations in 1 minute ? Explain your answer.

16. State how does the time period of a simple pendulum depend on length of pendulum.

17. State how does the time period of a simple pendulum depend on mass of bob.

▶ **Watch Video Solution**

18. State how does the time period of a simple pendulum depend on amplitude of oscillation .

▶ **Watch Video Solution**

19. State how does the time period of a simple pendulum depend on acceleration due to

gravity.

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20. What is a seconds pendulum?

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21. State the numerical value of the frequency of oscillation of a seconds' pendulum. Does it depend on the amplitude of oscillation ?

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1. The length of a simple pendulum is made one-fourth. Its time period becomes :

A. four times

B. one-fourth

C. double

D. half

Answer: D

2. The time period of a pendulum clock is :

A. 1s

B. 2s

C. 1 min

D. 12 h

Answer: B

3. The length of a second pendulum is

A. 0.5 m

B. 9.8 m

C. 1.0 m

D. 2.0m

Answer: C

1. A simple pendulum completes 40 oscillations in one minute. Find its frequency

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2. A simple pendulum completes 40 oscillations in one minute. Find its time period

.

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3. The time period of a simple pendulum is 2 s. What is its frequency ? What name is given to such a pendulum ?

4. A seconds' pendulum is taken to a place where acceleration due to gravity falls to one-fourth. How is the time period of the

pendulum affected, if at all ? Give reason. What will be its new time period ?

5. Find the length of a second.s pendulum at a place where $g = 10ms^{-2}$ (Take π = 3.14)

6. Compare the time periods of two pendulums of length 1 m and 9 m.

7. A pendulum completes two oscillations in 5s. What is its time period? If $g = 9.8\text{ms}^{-2}$, find its length.

8. A pendulum completes two oscillations in 5s. What is its time period? If $g = 9.8\text{ms}^{-2}$, find its length.

9. The time periods of two simple pendulums at a place are in the ratio 2:1. What will be the corresponding ratio of their lengths?

10. It takes 0.2 s for a pendulum bob to move from the mean position to one end. What is the time period of the pendulum?

11. How much time does the bob of a second.s pendulum take to move from one extreme to the other extreme of its oscillation?

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Topic 1 International System Of Units 2 Marks Questions

1. Define astronomical unit (A.U), write its value in metres.

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2. Write the symbol : Volume

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3. Write the symbol : Density

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4. Define SI unit. Write the unit of the following fundamental quantity in SI system.

(i) Temperature

(ii) Length

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5. What is meant by measurement

▶ **Watch Video Solution**

6. What do you understand by the term unit?

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7. If the size of bacteria is 1 micron, what will be the number of it in 1 m length?

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8. Name two units of length which are bigger than a meter. How are they related to the unit

meter?

9. Write the names of two units of length smaller than a meter. Express their relationship with meter.

Topic 1 International System Of Units 3 Marks Questions

1. List the different system of units.

2. State me difference between fundamental units and derived units.

3. The mass of a 4 cm cube is 512 gram, find its density.

(i) In SI units

(ii) In C.G.S units

4. The wavelength of light of a particular colour is 5800 Å. Express it in.

(i) nanometre and (ii)metre

5. Define the S.I. unit of three fundamental quantities.

6. Name the three systems of unit and state the various fundamental units in them.

7. Define a fundamental unit.

8. Explain the meaning of derived unit with the help of one example.

9. Name the three convenient units used to measure length ranging from very short to very long value. How are they related to the S.I. unit?

10. State two units of mass smaller than a kilogram. How are they related to the unit Kilogram?

11. State two units of mass bigger than a kilogram. Give their relationship with the kilogram.

12. What is lunar month?

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13. Name the physical quantities which are measured in the following units:

(a)u , (b) ly , (c) ns , (d) nm

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14. Write the derived units of the following :

(a) Speed , (b) Force , (c)Work , (d) Pressure

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15. How are the following derived units related

to the fundamental units ?

(a)Newton , (b)Watt , (c) Joule , (d) Pascal

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16. Name the physical quantities related to the following units :

(a) km^2 , (b) kgm^{-3} , (c) ms^{-2} , (d) $kgms^{-1}$

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Topic 1 International System Of Units 4 Marks Questions

1. List the fundamental units with their symbols.

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2. Finalise the standard prefixes with their symbols which are attached to the units in the decreasing order.

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1. What is a simple pendulum ? Is the pendulum used in a pendulum clock simple

pendulum ? Give reason to your answer.

2. The time period of a simple pendulum is 2 s.

What is its frequency?

3. A simple pendulum completes 40

oscillations in one minute. Find its frequency

4. A simple pendulum completes 40 oscillations in one minute. Find its time period

.

5. Find the length of a second.s pendulum at a place where $g = 10ms^{-2}$ (Take π = 3.14)

6. On what factors does the period of a simple pendulum depend ?

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7. Compare the time periods of two pendulums of length 1 m and 9 m.

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8. Name two factors on which the time period of a simple pendulum does not depend.

9. A pendulum completes two oscillations in 5s. What is its time period? If $g = 9.8\text{ms}^{-2}$, find its length.

10. The time periods of two simple pendulums at a place are in the ratio 2:1. What will be the corresponding ratio of their lengths?

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11. It takes 0.2 s for a pendulum bob to move from the mean position to one end. What is the time period of the pendulum?

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12. How much time does the bob of a second.s pendulum take to move from one extreme to the other extreme of its oscillation?

13. Two simple pendulums A and B have equal lengths, but their bobs weigh 50 gm and 100 gm, respectively. What would be the ratio of their time periods? Give reasons for your answer.

14. Two simple pendulums A and B have lengths 1.0 m and 4.0 m respectively at a certain place. Which pendulum will make more oscillations in 1 minute ? Explain your answer.

15. State how does the time period of a simple pendulum depend on length of pendulum.

16. State how does the time period of a simple pendulum depend on mass of bob.

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17. State how does the time period of a simple pendulum depend on amplitude of oscillation .

▶ **Watch Video Solution**

18. State how does the time period of a simple pendulum depend on acceleration due to gravity.

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19. State the numerical value of the frequency of oscillation of a seconds' pendulum. Does it depend on the amplitude of oscillation ?

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1. Draw a neat diagram of a simple pendulum. Show on it the effective length of the pendulum and its one oscillation.

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2. Define oscillation related to a simple pendulum

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3. Define the Amplitude

4. How is the frequency of a wave related to its

time period ?

5. Define the term time period as related to a

simple pendulum.

6. A seconds' pendulum is taken to a place where acceleration due to gravity falls to one-fourth. How is the time period of the pendulum affected, if at all ? Give reason. What will be its new time period ?

7. How is the time period of a simple pendulum affected, if at all, in the following situation

the length is made four times.

8. How is the time period of a simple pendulum affected, if at all, in the following situations: The acceleration due to gravity is reduced to one-fourth

9. How do you measure the time period of a given pendulum? Why do you note the time for more than one oscillation?

10. How does the time period (T) of a simple pendulum depend on its length (l)? Draw a graph showing the variation of T_2 with l. How

will you use this graph to determine the value of g (acceleration due to gravity) ?

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Topic 2 Simple Pendulum 4 Marks Questions

1. The length of the simple pendulum is 40 cm. Calculate its time period.

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