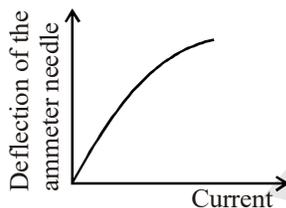


[SINGLE CORRECT CHOICE TYPE]

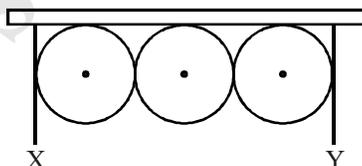
- Q.1 While measuring length of an object it was observed that the zero of the vernier lies between 1.4 and 1.5 of the main scale and the fifth vernier division coincides with a main scale division. If the length of the object measured is  $\ell$ , then the value of  $(\ell - 1.4)$  in terms of the least count C of the instrument is [3]  
 (A) C (B) 1.45 C (C) 4 C (D) 5 C
- Q.2 The deflection of the needle of an ammeter varies with the current passing through the ammeter is shown in the graph. [3]



Which diagram could represent the appearance of the scale of this meter ?

- (A) (B) (C) (D)

- Q.3 The percentage error in calculation of specific resistance, where  $r$  = radius of wire =  $0.26 \pm 0.02$  cm,  $\ell$  = length of wire =  $156.0 \pm 0.1$  cm,  $R$  = resistance of wire =  $64 \pm 2$  ohm will be [3]  
 (A) 18.57 (B) 10.02 (C) 5.38 (D) 6.42
- Q.4 A tangent galvanometer is used to measure the value of current using its deflection angle measurement. It is found that,  
 $I \propto \tan \theta$ ; where  $\theta$  = angle of deflection.  
 For what value of angular deflection, the instrument is most accurate [3]  
 (A)  $30^\circ$  (B)  $45^\circ$  (C)  $60^\circ$  (D)  $0^\circ$
- Q.5 The length of pendulum is measured as 20.0 cm. The time interval for 100 oscillations is measured as 90 sec with a stop watch of 1s resolution. The inaccuracy in the determination of 'g' is [3]  
 (A) 1% (B) 2% (C) 3% (D) 4%
- Q.6 A student attempts to measure the radius of a steel ball by using a ruler to measure three identical balls in a row. The student estimates the positions on the scale to be as follows  
 $X : (2.0 \pm 0.3)$  cm       $Y : (7.0 \pm 0.3)$  cm  
 What is the radius of the ball together with its associated uncertainty? [3]

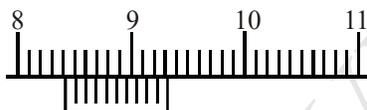


- (A)  $(0.9 \pm 0.1)$  cm (B)  $(0.8 \pm 0.1)$  cm (C)  $(0.7 \pm 0.2)$  cm (D)  $(0.70 \pm 0.15)$  cm

- Q.7 Four students measured and calculated the electronic charge "e". The table shows the result obtained. Which of the students obtained a set of results that could be described as relatively more accurate and more precise. [3]

Student	Electronic charge, e ( $10^{-19}$ C)	[3]
(A)	1.62, 1.59, 1.59, 1.61, 1.60	
(B)	1.57, 1.63, 1.64, 1.58, 1.59	
(C)	1.59, 1.60, 1.58, 1.57, 1.57	
(D)	1.58, 1.62, 1.65, 1.59, 1.66	

- Q.8 The length of a plate is measured with the help of a vernier calipers having zero error  $-0.02$  cm. The observation is shown in figure. Then length of the plate from these observations is (L.C. = 0.01 cm) [3]



- (A) 8.40 cm      (B) 8.44 cm      (C) 8.42 cm      (D) 8.46 cm

- Q.9 If two ammeters X and Y require 40 mA and 50 mA respectively to give same full scale deflection, then : [3]  
 (A) Y is more sensitive  
 (B) X is more sensitive  
 (C) Both X and Y can be equally sensitive  
 (D) It would not be possible to assess the sensitivity on the basis of the given data

- Q.10 A physical quantity  $\rho$  is calculated by using the formula  $\rho = \frac{1}{10} \frac{xy^2}{z^{1/3}}$ , where x, y and z are experimentally measured and percentage error in their measurement are 2%, 1% and 3%, respectively, then the maximum percentage error in the calculation of  $\rho$  is [3]  
 (A) 0.5%      (B) 5%      (C) 6%      (D) 7%

- Q.11 The distance moved by the screw of a screw gauge is 2 mm in four rotations and there are 50 divisions on its cap. When nothing is put between its jaws, 30<sup>th</sup> division of circular scale coincides with reference line, with zero of main scale clearly visible. When a plate is placed between the jaws, main scale reads 2 divisions and circular scale reads 20 divisions. Thickness of plate is : [3]  
 (A) 0.9 mm      (B) 1.2 mm      (C) 1.4 mm      (D) 1.5 mm

- Q.12 The length of a cylinder is measured with a metre rod having least count 0.1 cm. Its diameter is measured with vernier calipers having least count 0.01 cm. Given that length is 5.0 cm and radius is 2.0 cm. The percentage error in the calculated value of the volume will be : [3]  
 (A) 1.5%      (B) 2%      (C) 3%      (D) 4%

- Q.13 The mass of a body is measured as 10.1 kg. The possible percentage error in the measurement is [3]  
 (A)  $\pm 1\%$       (B)  $\pm 0.1\%$       (C)  $\pm 10\%$       (D)  $\pm 0.01\%$

- Q.14 Four persons use the same stopwatch (of least count 100 ms) to measure the time-period of a pendulum. Which of following assertions is possibly correct ? [3]  
 (A) First person says that the time period is 3.75s  
 (B) Second person says that the time period is 2.1 s  
 (C) Third person says that the time period is 3.70s  
 (D) Fourth person says that the time period is 2.92s

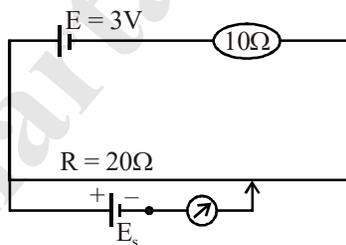
- Q.15 A physical quantity  $x$  is being calculated by measuring  $y$  and  $z$  and using the formula  $x = y \times z$ . In a particular set of values, the value of  $y$  is measured with an error of  $+10\%$ , whereas the value of  $z$  is measured with an error of  $-10\%$ . For this particular set of values, the error in the calculation of  $x$  will be  
 (A)  $0\%$  (B)  $20\%$  (C)  $-1\%$  (D)  $10\%$  [3]
- Q.16 In an experiment to measure the focal length of an equiconvex lens, following measurements were made  $|u| = 0.30$  cm,  $|v| = 0.60$  cm. The image formed is real. The focal length of the lens within error limits is  
 (A)  $(0.20 \pm 0.01)$  cm (B)  $(0.20 \pm 0.02)$  cm  
 (C)  $(0.20 \pm 0.0055)$  cm (D)  $(0.20 \pm 0.005)$  cm [3]
- Q.17 In an experiment to measure the length of a rod by four different instruments, the measurement are reported as  
 (A)  $200$  mm (B)  $20$  cm (C)  $20.00$  cm (D)  $0.20$  m [3]  
 Which of the instrument is most precise?
- Q.18 The number of significant digits in the number  $0.029982 \times 10^{-5}$  are  
 (A)  $6$  (B)  $5$  (C)  $7$  (D)  $4$  [3]

**[REASONING TYPE]**

- Q.19 **Statement-1** : The momentum of a body has a magnitude  $p = mu$ . This result can not be written as  $\log p = \log m + \log u$ .  
**Statement-2** : The expression of  $\log p = \log m + \log u$  is dimensionally inconsistent. [3]  
 (A) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.  
 (B) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1.  
 (C) Statement-1 is true, statement-2 is false.  
 (D) Statement-1 is false, statement-2 is true.

**[MULTIPLE CORRECT CHOICE TYPE]**

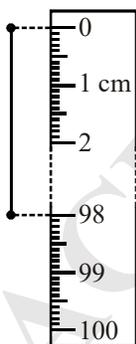
- Q.20 A  $10$  m long potentiometer wire has a resistance of  $20$  ohm. It is connected in series with a battery of emf  $3V$  and a resistance of  $10\Omega$ . The internal resistance of the secondary cell is negligible. If the length can be read accurately upto  $1$  mm, the potentiometer can read voltage [4]



- (A) upto a maximum of  $2V$  (B) upto a minimum of  $0.1$  mV  
 (C) with an accuracy of  $0.1$  mV (D) with an accuracy of  $0.2$  mV
- Q.21 In a resonance column experiment, the length of air column at  $1^{st}$  resonance is measured to be  $13.1$  cm with a possible indeterminate error of  $0.1$  cm. With the same scale, the  $2^{nd}$  resonance occurs at  $39.2$  cm. The possible wavelength of the sound can be [4]  
 (A)  $52.2$  cm (B)  $52.4$  cm (C)  $52.6$  cm (D)  $52.0$  cm

[SUBJECTIVE TYPE]

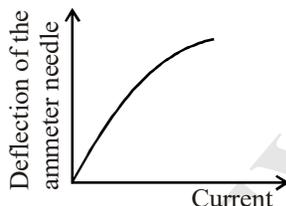
- Q.22 Intensity observed in an interference pattern is  $I = I_0 \sin^2 \theta$ . At  $\theta = 30^\circ$ , intensity is  $I = 5.0000 \pm 0.0020$   $\text{w/m}^2$ . Find percentage error in angle, if  $I_0 = 20 \text{ w/m}^2$ . [5]
- Q.23 The unknown resistance in a meter bridge is given by  $x = \left( \frac{\ell}{100 - \ell} \right) R$  where  $\ell$  is the distance of null point from one end. Find the value of  $\ell$  for which error in determination of  $x$  is minimum. [5]
- Q.24 Following figure shows an experimental set up to determine acceleration due to gravity. Following measurements were taken.  
 (i)  $\ell = 98.0 \text{ cm}$   
 (ii) Time for 50 oscillations is 98s.  
 If the least count of the stop watch is 1s, what is the calculated value of acceleration due to gravity in this experiment. [5]



- Q.25 The diameter of a wire of length 50 cm is measured with the help of a screw gauge. The main scale reading is 1 mm and circular scale reading is 25. Pitch of the screw gauge is 1 mm and the total number of divisions on the circular scale is 100. This wire is used in an experiment of determination for the Young's modulus of material of a wire by Searle's method. The following data are available : elongation in the wire  $\ell = 0.125 \text{ cm}$  under the tension of 50 N, least count for measuring normal length of wire is 0.01 cm and for elongation in the wire is 0.001 cm. The maximum percentage error in calculating value of Young's modulus ( $Y$ ) is  $n \times 0.484$ . Find  $n$ . (assuming that the force is measured very accurately, where symbols have their usual meaning). [5]

[SINGLE CORRECT CHOICE TYPE]

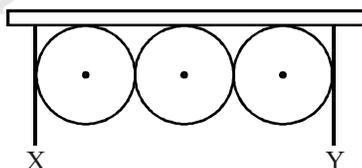
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Which diagram could represent the appearance of the scale of this meter ?



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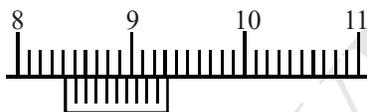


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(B)	1.57, 1.63, 1.64, 1.58, 1.59	
(C)	1.59, 1.60, 1.58, 1.57, 1.57	
(D)	1.58, 1.62, 1.65, 1.59, 1.66	

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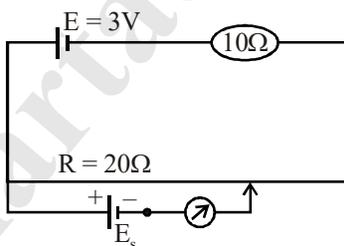
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 (A) 200 mm (B) 20 cm (C\*) 20.00 cm (D) 0.20 m [3]  
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**[REASONING TYPE]**

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**[MULTIPLE CORRECT CHOICE TYPE]**

- Q.20 A 10 m long potentiometer wire has a resistance of 20 ohm. It is connected in series with a battery of emf 3V and a resistance of  $10\Omega$ . The internal resistance of the secondary cell is negligible. If the length can be read accurately upto 1 mm, the potentiometer can read voltage [4]



- (A\*) upto a maximum of 2V (B) upto a minimum of 0.1 mV  
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- Q.21 In a resonance column experiment, the length of air column at 1<sup>st</sup> resonance is measured to be 13.1 cm with a possible indeterminate error of 0.1 cm. With the same scale, the 2<sup>nd</sup> resonance occurs at 39.2 cm. The possible wavelength of the sound can be [4]  
 (A\*) 52.2 cm (B\*) 52.4 cm (C\*) 52.6 cm (D\*) 52.0 cm

**[SUBJECTIVE TYPE]**

Q.22 Intensity observed in an interference pattern is  $I = I_0 \sin^2 \theta$ . At  $\theta = 30^\circ$ , intensity is  $I = 5.0000 \pm 0.0020$   $\text{w/m}^2$ . Find percentage error in angle, if  $I_0 = 20 \text{ w/m}^2$ . [5]

Ans.  $\frac{4}{\pi} \sqrt{3} \times 10^{-2}\% \left( \frac{0.12}{\sqrt{3} \pi} \% \right)$

Q.23 The unknown resistance in a meter bridge is given by  $x = \left( \frac{\ell}{100 - \ell} \right) R$  where  $\ell$  is the distance of null point from one end. Find the value of  $\ell$  for which error in determination of  $x$  is minimum. [5]

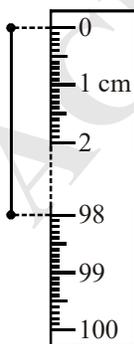
Ans. 50 cm

Q.24 Following figure shows an experimental set up to determine acceleration due to gravity. Following measurements were taken.

(i)  $\ell = 98.0$  cm

(ii) Time for 50 oscillations is 98s.

If the least count of the stop watch is 1s, what is the calculated value of acceleration due to gravity in this experiment. [5]



Ans.  $[(10.1 \pm 0.2) \text{ ms}^{-2}]$

Q.25 The diameter of a wire of length 50 cm is measured with the help of a screw gauge. The main scale reading is 1 mm and circular scale reading is 25. Pitch of the screw gauge is 1 mm and the total number of divisions on the circular scale is 100. This wire is used in an experiment of determination for the Young's modulus of material of a wire by Searle's method. The following data are available : elongation in the wire  $\ell = 0.125$  cm under the tension of 50 N, least count for measuring normal length of wire is 0.01 cm and for elongation in the wire is 0.001 cm. The maximum percentage error in calculating value of Young's modulus ( $Y$ ) is  $n \times 0.484$ . Find  $n$ . (assuming that the force is measured very accurately, where symbols have their usual meaning). [5]

Ans.  $n = 5$