Abbes Laghrour University Of Khenchela
Faculty of Science and Technology

Level: 2nd Year ***Field: ME, CE and PW***
Course Title: Metrology ***Academic year: 2024/2025***

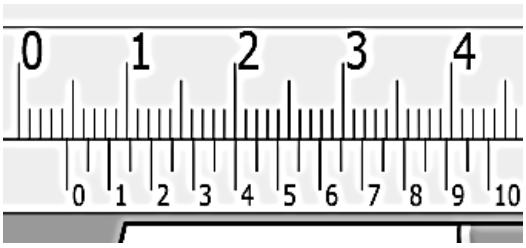
FIRST EXAM

Question N°1: Choose the right answer

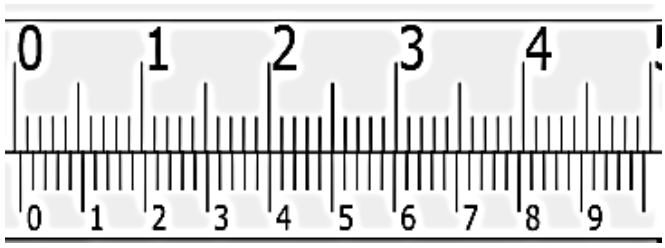
1. What is the definition of metrology?
   a) The calculation of technical parameters of different devices.
   b) The science of measurement.
   c) The creation of scientific protocols for the development of new products.
2. What was one of the first measurement systems used by ancient civilizations?
   a) The foot and the mile.
   b) The meter and the kilogram.
   c) The cubit.
3. Why is metrology important in healthcare?
   a) To ensure the accuracy of medication dosage.
   b) To guarantee patient safety.
   c) All of the above are correct
4. What is the current definition of the kilogram based on?
   a) The International Prototype of the Kilogram
   b) The speed of light
   c) The Planck constant
5. Which constant is used to define the kelvin?
   a) Planck constant b) Boltzmann constant c) Avogadro constant d) Elementary charge
6. Which statement best defines precision?
   a) The ability of a measurement to be close to the true value
   b) The ability of repeated measurements to be close to each other
   c) The tendency of measurements to vary randomly
7. What happens to the fractional error in a sum Q = x + y if $x_0 \gg y_0$?
   a) It equals fx b) It equals f_y c) It becomes negligible
8. If x has a fractional error of $f_x = 0.005$**,** what is the fractional error in $Q = x^{3/2}$?
   a) 0.0075 b) 0.01 c) 0.00375 d) 0.015
9. If x has a fractional error of f_x=0.002, what is the fractional error in $Q=\sqrt{x}$
   a) 0.001 b) 0.004 c) 0.002 d) 0.01
10. If x has a fractional error $f_x = 0.002$ and y has $f_y = 0.003$, what is the fractional error in $Q = x^2y$?
    a) 0.004 b) 0.007 c) 0.005 d) 0.008

Good Luck

Question N°2: Indicate the reading and the precision in following examples:



Precision = lecture =



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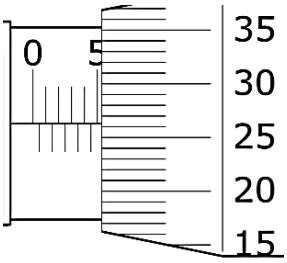
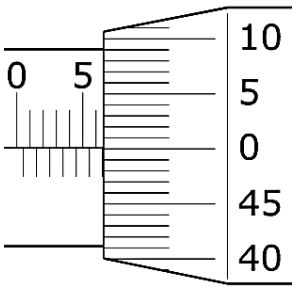


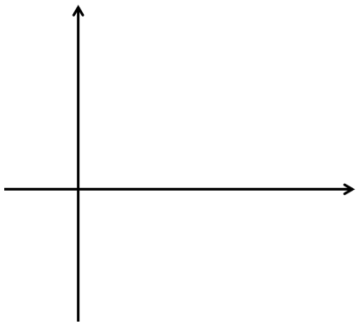
Precision = lecture =



Precision = lecture =

Question 3:

Find the fit type and the tolerance of **Φ 30 H11/c11**



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EXAM CORRECTION

- Question N°1: 10 pts

Choose the right(s) answer(s)

1. What is the definition of metrology?
   b) The science of measurement.
2. What was one of the first measurement systems used by ancient civilizations?
   c) The cubit.
3. Why is metrology important in healthcare?
   d) All of the above are correct
4. What is the current definition of the kilogram based on?
   c) The Planck constant
5. Which constant is used to define the kelvin?
   b) Boltzmann constant
6. Which statement best defines precision?
   b) The ability of repeated measurements to be close to each other
7. What happens to the fractional error in a sum **Q= x+y** if $\mathbf{x_0 \gg y_0}$?
   a) It equals f_x
8. If **x** has a fractional error of $\boldsymbol{f_x}$ **=0.005,** what is the fractional error in $\mathbf{Q=x^{3/2}}$?
   a) 0.0075
9. If x has a fractional error of f_x=0.002, what is the fractional error in Q=√x
   a) 0.001
10. If x has a fractional error f_x=0.002 and y has f_y=0.003, what is the fractional error in $Q=x^2y$?
    b) 0.007

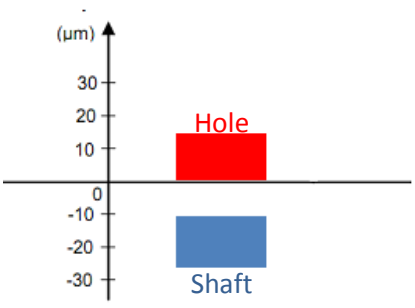
Question N°2: 4 pts

1)	Precision = 0.05	lecture = 4.45	Precision = 0.02	lecture = 0.46
2)	Precision = 0.01	lecture = 5.26	Precision = 0.01	lecture = 6.50

Question N°3: 6 pts

For the Hole H11 $(30_{0}^{+0.13})$ **the Shaft** c11 $(30_{-0.24}^{-0.11})$

Fit type ======= Clearance Fit



- **Hole:**

  $Max_{diam.}$ = 30+0.13 = 30.13 mm , $Min_{diam.}$ = 30+0 = 30 mm

  Tol. = 30.13 – 30 = 0.13 mm

- **Shaft**

  Max_{diam} = 30-0.11 = 29.89 mm , Min_{diam} = 30-0.24 = 29.76 mm

  Tol. = 29.89-29.76 = 0.13 mm

Max. Clearance = 30.13-29.76 = 0.37 mm

Min. Clearance = 30-29.89 = 0.11 mm