# BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

## School of Manufacturing Skills

**Session: 2021-22 (Winter Semester)**

**B. Voc. Program, III Semester,**

**2nd In-Sem. Examination**

**Course Code: SMS1302** **Time: 1 Hour**

**Course Name: CNC Turning** **Max. Marks: 20**

**Instructions:**

1. Attempt all questions.
2. Section A contains 05 Questions. Each question carries 1 Mark.
3. Section B contains 03 Questions. Each question carries 2 Marks.
4. Section C contains 03 Questions. Each question carries 3 Marks.

### Section – A

05X01 = 05 Marks

1. G02 is named as:
   a) Circular Interpolation Clockwise
   b) Rapid Traverse
   c) Linear Interpolation
   d) Circular Interpolation Counterclockwise
2. G-Code used for Linear Interpolation is:
   a) G01
   b) G02
   c) G03
   d) G04
3. Tool mount reference point is denoted by:
   a) M
   b) W
   c) R
   d) N
4. M30 is used for:
   a) Optional Stop
   b) Main Program End
   c) Sub-Program End
   d) Tool Change
5. G03 is used for:
   a) Circular interpolation clockwise
   b) Circular interpolation anticlockwise
   c) Rapid traverse
   d) Linear interpolation

**Section – B**

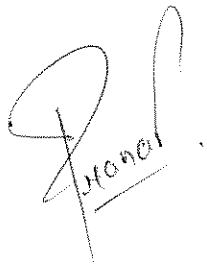
03X02 = 06 Marks

6. Write down the syntax of Facing Cycle.
7. Write down the formulas for calculating Major Diameter, Thread Depth, Minor Diameter and Chamfer for External Metric Threads.
8. Write down the syntax of G72 Cycle.

**Section – C**

03X03 = 09 Marks

9. Explain Contour Turning Cycle in detail.
10. Explain Threading Cycle.
11. What is Grooving Cycle?



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**Course Code: SMS1302** **Time: 1 Hour**

**Course Name: CNC Turning** **Max. Marks: 20**

**Answer Key**

**Section – A**

05X01 = 05 Marks

1. G02 is named as:
   - **a) Circular Interpolation Clockwise**
   - b) Rapid Traverse
   - c) Linear Interpolation
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   - **a) G01**
   - b) G02
   - c) G03
   - d) G04
3. Tool mount reference point is denoted by:
   - a) M
   - b) W
   - c) R
   - **d) N**
4. M30 is used for:
   - a) Optional Stop
   - **b) Main Program End**
   - c) Sub-Program End
   - d) Tool Change
5. G03 is used for:
   - a) Circular interpolation clockwise
   - **b) Circular interpolation anticlockwise**
   - c) Rapid traverse
   - d) Linear interpolation

**Section – B**

03X02 = 06 Marks

6. Write down the syntax of Facing Cycle.

**Format**
N... G74 $W_1$... R...
N... G74 P... Q... U+/-... $W_2$+/-... F... S... T...

first block $W_1$ [mm] depth of cut in Z, incremental, without sign, in the drawing shown as $W_1$
R [mm] retract height
second block P..... block number of the first block for the programmed shape
Q ..... block number of the last block for the programmed shape
U [mm] distance and direction of finishing offset in X direction (diameter or radius designation), in the drawing shown as U/2
$W_2$ [mm] Distance and direction of finishing offset in Z direction, incremental, without sign, in the drawing shown as $W_2$
F, S, T Feed, speed, tool

7. Write down the formulas for calculating Major Diameter, Thread Depth, Minor Diameter and Chamfer for External Metric Threads.

$Major\ Dia. = Nominal\ Dia. + 10\%\ of\ Pitch$

$Thread\ Depth = 0.614\ X\ Pitch$

$Minor\ Dia. = Major\ Dia. - (2\ X\ Thread\ Depth)$

$Chamfer = Thread\ Depth + 0.3$

8. Write down the syntax of G72 Cycle.

**Format**
N... G72 P... Q...

P..... Block number of the first block for the program of finishing shape.
Q ..... Block number of the last block for the program of finishing shape.

## Section – C

03X03 = 09 Marks

9. Explain Contour Turning Cycle in detail.

**Format**
N... G73 $U_1$... R...
N... G73 P... Q... $U_2$+/-... W+/-... F... S... T...

first block $U_1$ [mm] depth of cut, incremental, without sign, in the drawing shown as $U_1$
R [mm] retract height
second block P..... block number of the first block for the programmed shape
Q ..... block number of the last block for the programmed shape
$U_2$ [mm] distance and direction of finishing offset in X direction (diameter or radius designation), in the drawing shown as $U_2$/2
W [mm] Distance and direction of finishing offset in Z direction, incremental, without sign
F, S, T Feed, speed, tool

10. Explain Threading Cycle.

**Format**
N... G78 $P_1$... $Q_1$... $R_1$...
N... G78 X(U)... Z(W)... $R_2$... $P_2$... $Q_2$... F...

first block:

$P_1$ ..... is a 6 digit parameter divided in digit couples:

PXXxxxx → The first two digits of this parameter define the number of finishing cuts

PxxXXxx → The next two digits define the chamfer value $P_F$ (see drawing)

$$P_{xxXxx} = \frac{P_F\,[mm] \times 10}{F}$$

PxxxxXX → Defines the flank angle of thread in [°] (allowed: 0,29,30,56,60,80)

$Q_1$ ..... Minimum cutting depth [µm] incremental

$R_1$ ..... Finishing offset [mm] incremental

second block X(U), Z(W) Absolute (incremental) coordinates of the point K

$R_2$ [mm] Incremental taper value with sign (R=0 cylindrical thread)

$P_2$ [µm] Thread depth (always positive), in the drawing shown as $P_2$

$Q_2$ [µm] Cutting depth of the first cut (radius value) without sign

F [mm] Thread pitch

11. What is Grooving Cycle?

**Format**
N... G77 $R_1$...
N... G77 X(U)... Z(W)... P... Q... $R_2$... F...

first block $R_1$ [mm] Retraction height for chip breaking, in the drawing shown as $R_1$

sec. block X(U), Z(W) Absolute (incremental) coordinates of K

P [µm] Cutting depth in X direction (no sign)

Q [µm] Incremental infeed in Z direction (no sign)

R ..... Undercut at X end point, in the drawing shown as $R_2$

F ..... Feed

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**Session: 2021-22 (Winter Semester)**

**B. Voc. Program, III Semester,**

**2nd In-Sem. Examination**

**Course Code: SMS1304** **Time: 1 Hour**

**Course Name: Pneumatics** **Max. Marks: 20**

**Instructions:**

1. Attempt all questions.
2. Use of Calculators is Prohibited.
3. Section A contains 05 Questions. Each question carries 1 Mark.
4. Section B contains 03 Questions. Each question carries 2 Marks.
5. Section C contains 03 Questions. Each question carries 3 Marks.

### Section – A

05X01 = 05 Marks

1. In pneumatic the volume flow of air is expressed in term of:
   a) $M^3/s$
   b) L/m
   c) Both a and b
   d) None of above
2. Fluid power system is based on:
   a) Bernoulli's principle
   b) Gas law
   c) Avogadro's law
   d) Pascal law
3. Standard atmospheric pressure is-
   a) 1.013 MPa
   b) 1.013 Pa
   c) 1.013 bar
   d) 1.013 N/m2
4. What is L in FRL unit-
   a) Lubricant
   b) Liquid
   c) Lubricator
   d) Lubrication
5. When PV=Constant, if we increase the volume then pressure will.....?
   a) Remains constant
   b) Decrease
   c) Increase
   d) none of these

**Section – B**

03X02 = 06 Marks

6. Draw the symbol of Pressure Switch and Pressure Regulator.
7. Define Pressure and Pascal Law.
8. Draw the symbol of FRL unit. Also write it's another name and its function.

**Section – C**

03X03 = 09 Marks

9. What is Air Production system? Explain all the components of Air production system.
10. Explain any five differences between *Pneumatic System* and *Hydraulic System.*
11. Describe any five advantages of using atmospheric air in Pneumatics.

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## School of Manufacturing Skills

**Session: 2021-22 (Winter Semester)**

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**Course Code: SMS1304** **Time: 1 Hour**

**Course Name: Pneumatics** **Max. Marks: 20**

**Answer sheet**

**Section – A**

05X01 = 05 Marks

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   a) Remains constant
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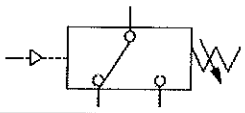
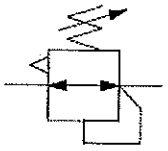
   c) Increase
   d) none of these

# BHARTIYA SKILL DEVELOPMENT UNIVERSITY

**Section – B**

03X02 = 06 Marks

6. Draw the symbol of Pressure Switch and Pressure Regulator.

| | | |
|---|---|---|
| Pressure Switch |  | Maintains a Pressure Range between minimum and maximum |
| Pressure Regulator |  | It regulates the air pressure i.e. increase or decrease air pressure. |

7. Define Pressure and Pascal Law.

- **Pressure** is defined as force per unit area. The standard unit for pressure is the Pascal, which is Newton per square meter.

$$P = \frac{F}{A} = \frac{N}{mm^2}$$

This unit is small and to avoid huge number, we use bar.

100,000 pa = 100KPa = 1bar

A pressure in the pneumatics is over-pressure (above the atmosphere pressure) and referred as gauge pressure.
A pressure below the atmosphere is under pressure or vacuum. **The standard atm. Pr is 1.013 bar.**

**Pascal law**

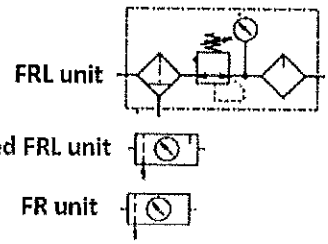
- An external pressure applied to a fluid in a closed vessel is uniformly transmitted throughout the fluid.

$$P1 = P2$$

$$\frac{F1}{A1} = \frac{F2}{A2}$$

8. Draw the symbol of FRL unit. Also write it's another name and its function.

- It is a combine unit of Filter, Pressure regulator and Lubricator elements
- It's also known as Air service unit.



**Section – C**

03X03 = 09 Marks

9. What is Air Production system? Explain all the components of Air production system.
   a) Compressor
   b) Electric motor
   c) Pressure switch
   d) Check valve
   e) Tank
   f) Pressure gauge
   g) Auto/Manual drain
   h) Safety valve
   i) Air dryer
   j) Line Filter

10. Explain any five differences between *Pneumatic System* and *Hydraulic System.*

| S. No. | Hydraulic System | Pneumatic System |
|---|---|---|
| 1. | It uses a pressurized liquid as a fluid | It uses compressed gas, usually air, as a fluid |
| 2. | An oil hydraulic system operates at pressure up to 700 bar | A pneumatic system usually operates at 10–12 bar |
| 3. | Generally designed as closed system | Usually designed as open system |
| 4 | Valve operations are difficult | Valve operations are easy |
| 5 | Heavier in weight | Lighter in weight |
| 6 | Pumps are used to provide pressurized liquids | Compressors are used to provide compressed gases |
| 7 | The system has fire hazards | The system is free from fire hazards |
| 8 | Automatic lubrication is provided | Special arrangements for lubrication |

11. Describe any five advantages of using atmospheric air in Pneumatics.

- **Availability:** Air is available everywhere and can be compressed with a portable compressor so most factories and industries use this for many activities.
- **Storage:** It is easily stored in tanks in large volume.
- **Simplicity of Design:** Most pneumatic components are of simple design and structure.
- **Easy to Work:** Pneumatic components have simple control and are easily fitted to provide automation.
- **Choice of Movement:** It provides both linear movement and angular rotation with continuously variable operational speeds.

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## School of Manufacturing Skills

**Session: 2021-22 (Winter Semester)**

**B. Voc. Program, III Semester,**

**2nd In-Sem. Examination**

**Course Code: SMS1305** **Time: 1 Hour**

**Course Name: Material Science** **Max. Marks: 20**

**Instructions:**

1. Attempt all questions.
2. Use of Calculators is Prohibited.
3. Section A contains 05 Questions. Each question carries 1 Mark.
4. Section B contains 03 Questions. Each question carries 2 Marks.
5. Section C contains 03 Questions. Each question carries 3 Marks.

**Section – A**

05X01 = 05 Marks

1. What is the carbon percentage in cast iron?
   a) 0-0.6%
   b) 0.6-1%
   c) 1-2%
   d) more than 2%
2. Pig iron contains ---------- iron?
   a) 90 %
   b) 80%
   c) 92%
   d) 82%
3. _____ refers to make complex shape manufacturing parts?
   a) Forging
   b) Heat treatment
   c) Welding
   d) Casting
4. Pig iron is manufactured in which furnace?
   a) Electric arc furnace
   b) Puddling Furnace
   c) Cupola Furnace
   d) Blast furnace
5. Which one is not a mechanical properties of material?
   a) Toughness
   b) Hardness
   c) Brittleness
   d) density

## Section – B

03X02 = 06 Marks

6. What is steel?
7. Write down any two mechanical properties of material.
8. Write down any two production properties of material.

## Section – C

03X03 = 09 Marks

9. Explain manufacturing process of pig iron.
10. Explain effect of carbon.
11. Write a short note on
    a) density
    b) electric conductivity
    c) melting point temperature

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**Course Code: SMS1305** **Time: 1 Hour**

**Course Name: Material Science** **Max. Marks: 20**

**Answer Key**
**Section – A**

05X01 = 05 Marks

1. What is the carbon percentage in cast iron?
   a) 0-0.6%
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5. Which one is not a mechanical properties of material.
   a) Toughness
   b) Hardness
   c) Brittleness
   **d) Electric conductivity**

**Section – B**

03X02 = 06 Marks

6. What is steel?

Steel is an alloy material.

Steel is a mixture of iron and carbon.

Steel is widely used is automobile sector, infrastructure, building material.

Steel is easily available

Steel has good strength.

7. Write down any two mechanical properties of material ?

Hardness: Hardness refers to the resistance with which a material counters indent formation by a test indenter. Hard materials include hardened steel and hard metals. Soft materials include aluminum and copper.

Brittleness: A material is referred to as brittle if it fractures into pieces when exposed to impact. Ceramic material and glass as well as some types of cast iron and incorrectly hardened steels are brittle.

8. Write down any two production properties of material ?

Machinability:

It indicates whether and under which conditions a material can be manufactured using machining techniques, such as turning, milling and grinding. The surface quality of the machined surface, the machining conditions and the service life of the machine tools are quantifying parameters for the machinability.

Weldability:

It describes the suitability or unsuitability of a material for welding. Unalloyed and low alloy steels with a low carbon content have good welding properties. High alloy steels as well as aluminium and copper alloys can also be welded using special welding methods.

**Section – C**

03X03 = 09 Marks

9. Explain manufacturing process of pig iron ?

Steel and Iron Casting alloys are produced from Pig Iron. Pig Iron itself is extracted from Iron Ore in blast furnace.

Processes in the blast furnace

The blast furnace is loaded in layers with mixture of iron ore, aggregates and coke. The aggregates absorb the ore components of the iron ore when melting. The coke is partially burnt up by the hot air
that is blown in and provides the melting heat for the input materials. The remainder of the coke reduces the iron ore to metallic iron. It contains carbo released from the coke. The resulting liquid pig iron collects at the bottom of the blast furnace. It is released in run offs.

10. Explain effect of carbon ?

In chilled irons, the depth of chill decreases, and the hardness of the chilled zone increases, with increasing C content. C also increases the hardness of white cast irons. Low C white cast irons (2.50 % C) have a hardness of about 375 HB (Brinnel hardness), while white cast irons with fairly high total C (more than 3.50 %) have a hardness as high as 600 HB. In unalloyed white cast irons, high total C is essential for high hardness and maximum wear resistance. Carbon decreases the transverse breaking strength and increases the brittleness.Carbon also increases the tendency for graphite to form during solidification, especially when the Si content is also high. As a result, it is very important to keep the Si content low in high C white cast irons.

11.Write a short note on

a) density -

The density of a material is equal to the mass of a body divided by its volume.

Density can be visualised as the mass of a cube with each edge having length 1 dm. Units of density include $kg/dm^3$, $g/cm^3$ or $t/m^3$ for solids and liquids as well as $kg/m^3$ for gases.

b) electric conductivity-

Electric conductivity describes the ability of a material to conduct the electric current.

Silver, copper and aluminium are good electrical conductors. They are used as conductor materials. Substances that do not conduct electricity are referred to as insulators. These include plastics, ceramics and glass.

c) melting point temperature-

The melting point is the temperature at which a material starts to melt.

It is started in degrees Celsius ($^0C$) or Kelvin (K). Pure metals have a specific melting point. Alloys, such as steels and CuZn alloys have a melting range.

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**Session: 2021-22 (Winter Semester)**

**B. Voc. Program, III Semester,**

**2nd In-Sem. Examination**

**Course Code: SMS1308** **Time: 1 Hour**

**Course Name: Metrology & Measuring instruments** **Max. Marks: 20**

**Instruction:**

1. Attempt all questions.
2. Use of Calculators is Prohibited.
3. Section A contains 05 Questions. Each question carries 1 Mark.
4. Section B contains 03 Questions. Each question carries 2 Marks.
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**Section – A**

05X01 = 05 Marks

1. Full form of BIPM
   a) International Bureau of pressure and Measures
   b) International Bureau of Weights and Measures
   c) Bureau of International Weights and Measures
   d) Bureau of International pressure and Measures
2. How many standards used for length measurements?
   a) 5
   b) 2
   c) 3
   d) 4
3. Which device is used for angular measurements?
   a) Refractometer
   b) Autocollimator
   c) Tachometer
   d) Dial caliper
4. Magnification is the process which is used for.
   a) Reduction in size
   b) Enlarging in size

c) All of the above
d) None of these

5. The word metrology actually derives from the Greek words which are.

a) Metro and logy
b) Metron and logos
c) Metro and logo
d) Measure and logo

**Section – B**

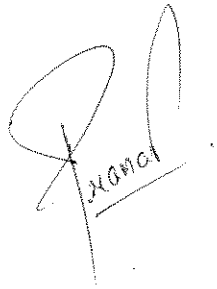
03X02 = 06 Marks

6. Define Metrology.
7. Explain any two.
   (1) Sensitivity
   (2) Magnification
   (3) Calibration
8. Write the types of error which is occur in sine bar.

**Section – C**

03X03 = 09 Marks

9. Write down the applications of CMM.
10. Explain working principle of sine bar.
11. Explain the accuracy and precision.



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**2nd In-Sem. Examination**

**Course Code: SMS1308** **Time: 1 Hour**

**Course Name: Metrology & Measuring instruments** **Max. Marks: 20**

**Answer Key**

**Section – A**

05X01 = 05 Marks

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   a) International Bureau of pressure and Measures
   **b) International Bureau of Weights and Measures**
   c) Bureau of International Weights and Measures
   d) Bureau of International pressure and Measures
2. How many standards used for length measurements?
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5. The word metrology actually derives from the Greek words which are.
   a) Metro and logy
   **b) Metron and logos**
   c) Metro and logo
   d) Measure and logo

## Section – B

03X02 = 06 Marks

6. Define Metrology?

ANS. The word metrology actually derives from the Greek words 'metron' and 'logos' which translated means the study of measurement.

7. Explain any two.

**SENSITIVITY**

Sensitivity is an absolute quantity, the smallest absolute amount of change that can be detected by a measurement.

**CALIBRATION**

In measurement technology and metrology, **calibration** is the comparison of measurement values delivered by a device under test with those of a calibration standard of known accuracy. Such a standard could be another measurement device of known accuracy, a device generating the quantity to be measured such as a voltage, a sound tone, or a physical artifact, such as a meter ruler.

**MAGNIFICATION**

**Magnification** is the process of enlarging the apparent size, not physical size, of something. This enlargement is quantified by a calculated number also called "magnification". When this number is less than one, it refers to a reduction in size, sometimes called magnification or de-magnification.

Typically, magnification is related to scaling up visuals or images to be able to see more detail, increasing resolution, using microscope, printing techniques, or digital processing. In all cases, the magnification of the image does not change the perspective of the image.

8. Write the types of error which is occur in sine bar.

Ans. **Types of errors in sine bar:**

**1.Progressive Angle Error:**

This error occurs due to error in the distance of centres of two rollers.

**2. Content Angle Error:**

This error occurs when the surface of the component and the roller axes are not parallel to each other.

## Section – C

03X03 = 09 Marks

9. Write down the applications of CMM.

**Ans.**

Application of CMM

- ✓ Aerospace Industries
- ✓ Automotive
- ✓ Food processing
- ✓ Healthcare

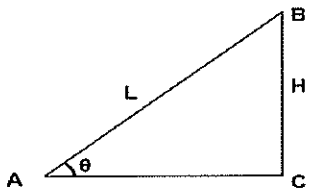
- ✓ Paper
- ✓ Pharmaceuticals
- ✓ Plastics
- ✓ Research and development
- ✓ Semiconductor

10. Explain working principle of sine bar.

Ans. Sine Bar is a precise angle measuring instrument. It is used to measure angles very accurately or to align the work piece at a given angle. Sine Bar is the most accurate instrument for measuring angles.

Sine bar is made up of high carbon high chromium corrosion resistance steel. Sine bar is made with this material so that it can avoid wear and tear of sine bar when handling. As the tear and wear are avoided, the errors are eliminated and the accuracy of the sine bar is maintained.

**Working Principle of Sine Bar:**
The principle of operation of the sine bar is based on the law of trigonometry.
If one roller of sine bar is placed on the surface plate and the other roller is placed on the height of slip gauges, then the structure formed by the sine bar, surface plate, and slip gauges forms a triangle.
The **hypotenuse** of this triangle is the sine bar, **perpendicular** is formed by combination of slip gauges and the surface plate is the **base.**
Suppose the height of slip gauges is **H** and the length of the sine bar is **L**, then sine ratio the angle theta will be **H** divided by **L**.
Now the angle **θ** can be calculated as **sin inverse** of **H** divided by **L**.



**Sine Bar Working Principle**

$$sin\theta = \frac{H}{L} \text{ or } \sin\theta = \frac{BC}{AB}$$

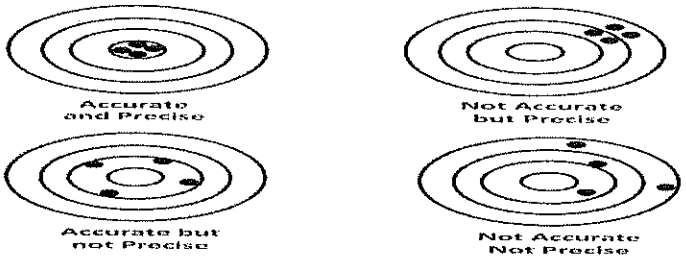
$$\theta = \sin^{-1}\left(\frac{H}{L}\right)$$

11. Explain the accuracy and precision.

Ans. **ACCURACY AND PRECISION**

In the fields of science and engineering the accuracy of a measurement system is the degree of closeness of measurements of a quantity to that quantity's true value. The precision of a measurement system, related

to reproducibility and repeatability, is the degree to which repeated measurements under unchanged conditions show the same results.




| Accuracy | Precision |
|---|---|
| Accuracy is closeness with the true value of the quantity being measured. | Precision is a measure of the reproducibility of the measurement. |
| Measurement can be accurate but not necessarily precise. | Measurement can be precise but not necessarily accurate. |
| It can be determined with a single measurement. | It needs serveral measurements to be determined. |
| Accuracy may be affected with systematic error. | Precision may be affected with random error. |
| Accurate values have to be precise in most cases. | Precise values may or may not be accurate. |
| Degree of conformity. | Degree of reproducibility. |