

**BHARTIYA SKILL DEVELOPMENT UNIVERSITY**

School of Automotive Skills

Session: 2021-22 (Summer Semester)

B. Voc. Program, 1st Semester,

2<sup>nd</sup> In-Sem. Examination

Course Code: AUT1101

Time: 1 Hour

Course Name: Automotive Power Train Chassis &amp; Suspension

Max. Marks: 20

Instruction:

1. Answer all questions from section A, each question carries one mark
2. Answer all question from section B, each question carries two mark.
3. Answer all question from section C, each question carries three mark.

**Section – A**

Directions: Select any one correct answer from the given options:

**05X01 = 05 Marks**

- 1) Connecting rod connects.....
  - A. Piston and Valves
  - B. Valves and Crankshaft
  - C. Piston and Camshaft
  - D. Piston and Crankshaft
- 2) When piston is at the top, the volume contained in the cylinder above the top of the piston is called...
  - A. Swept volume
  - B. Clearance volume
  - C. Total cylinder volume
  - D. None of these
- 3) Bore diameter is called.....
  - A. Volume of the cylinder
  - B. Internal diameter of the cylinder
  - C. Distance between T.D.C and B.D.C
  - D. None of the above
- 4) In a two stroke engine the working cycle completes in...
  - A. One revolution of crankshaft
  - B. Two revolutions of crankshaft
  - C. four revolutions of crankshaft
  - D. All of the above
- 5) Clutch in the Automobiles is used to.....
  - A. Start the engine
  - B. Cut off the power that is transmitted to Gear box from engine
  - C. Change the gear
  - D. None of these



Registration No.: .....

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### Section – B

**03X02 = 06 Marks**

- 6) Write down the full form of the following:
1. IC engine.
  2. CI engine.
- 7) Write a short note on two stroke engine.
- 8) Draw a labelled diagram of rear wheel drive vehicle.

### Section – C

**03X03 = 09 Marks**

- 9) Explain the working of four stroke petrol engine with the help of a diagram.
- 10) Write any 5 differences between Otto cycle and diesel cycle?
- 11) Briefly explain five different components of an IC engine.

*Vijay*



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**Section – A**

**Directions:** Select any one correct answer from the given options: 05X01 = 05 Marks

- 1) Connecting rod connects.....
  - A. Piston and Valves
  - B. Valves and Crankshaft
  - C. Piston and Camshaft
  - D. Piston and Crankshaft
- 2) When piston is at the top, the volume contained in the cylinder above the top of the piston is called...
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  - D. None of these

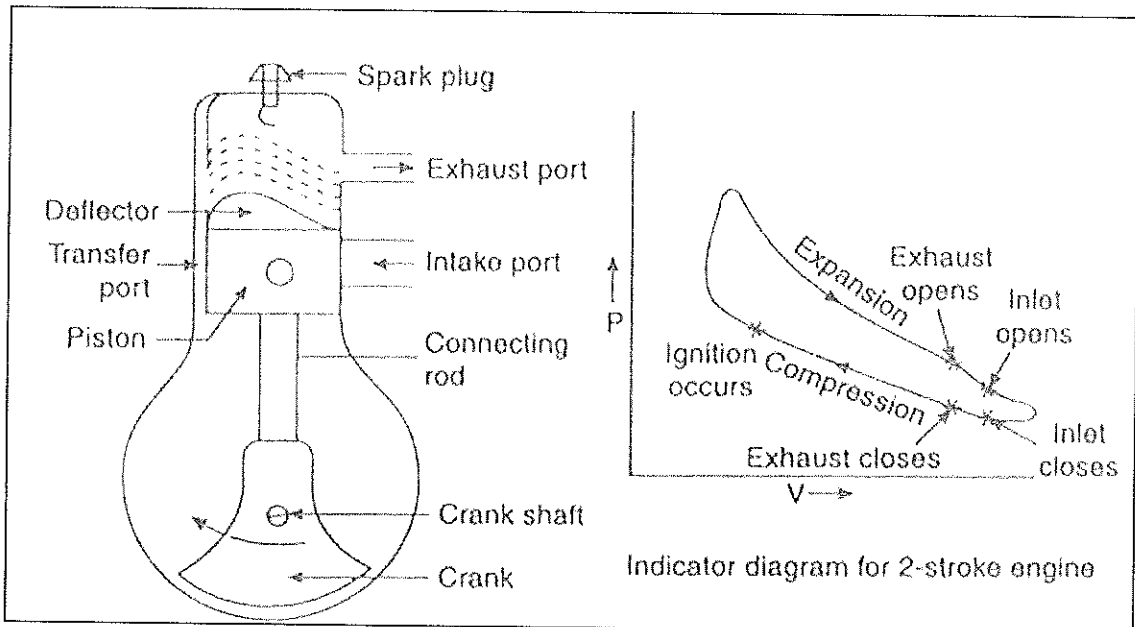
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### Section – B

03X02 = 06 Marks

- 6) Write down the full form of the following:
1. IC engine = Internal combustion engine
  2. CI engine = Compression ignition engine
- 7) Write a short note on two stroke engine.

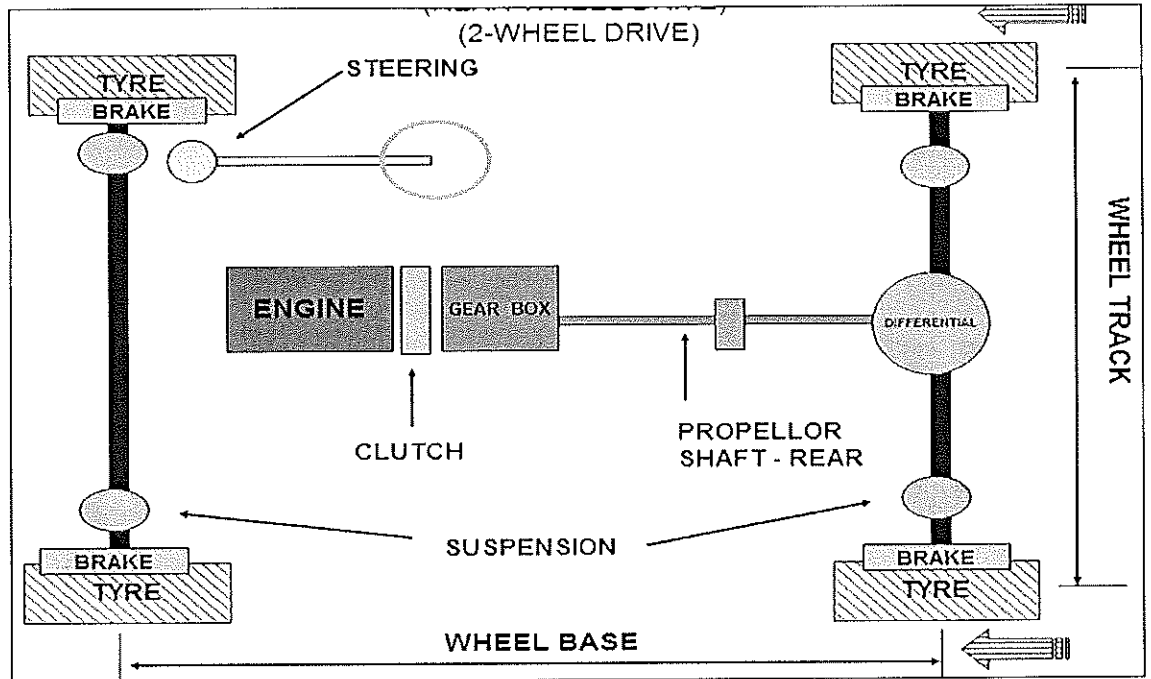
Ans.



- 8) Draw a labelled diagram of rear wheel drive vehicle.

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Ans.

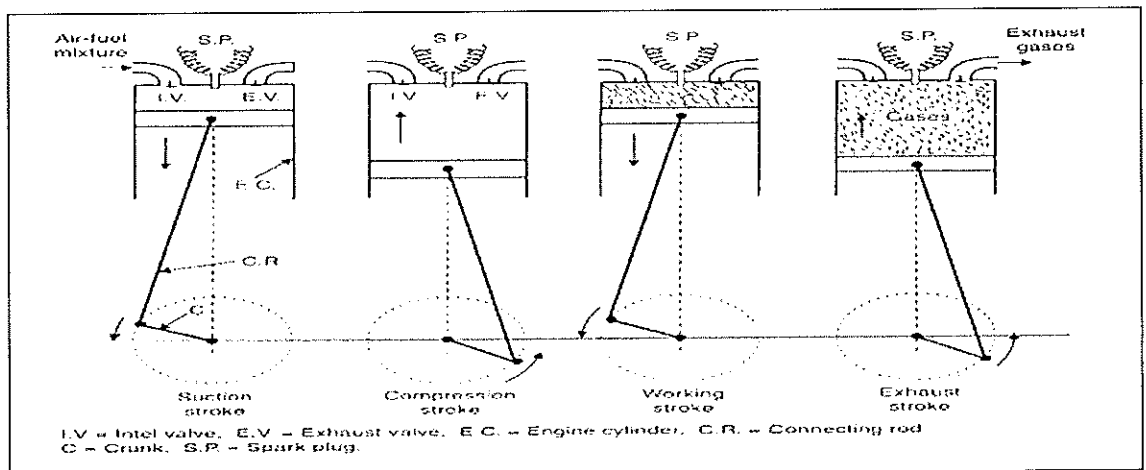


Section – C

03X03 = 09 Marks

9) Explain the working of four stroke petrol engine with the help of a diagram.

Ans.



10) Write any 5 differences between Otto cycle and diesel cycle?

S.NO.	Two stroke Engine	Four stroke
-------	-------------------	-------------

1.

When the cycle is completed in one revolution of crankshaft, it is called as 2-stroke cycle engine.

When the cycle is completed in two revolutions of crankshaft, it is called as 4-stroke cycle engine.



Registration No.: .....

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- |    |  |                 |
|----|--|-----------------|
| 2. | One power stroke for each revolution of the crankshaft.  | One power s     |
| 3. | There are inlet and exhaust ports in the engine.         | There are inl   |
| 4. | The crankshaft is fully closed and also it is air tight. | The cranksha    |
| 5. | Size of the flywheel is comparatively smaller.           | Size of the fly |
| 6. | Removal of exhaust gases comparatively difficult.        | Removal of e    |
| 7. | Mostly high speed engines are in this type.              | All speed typ   |

11) Briefly explain five different components of an IC engine.

- Ans. Cylinder
- Cylinder head
- Piston
- Piston rings
- Gudgeon pin
- Connecting Rod
- Crankshaft
- Crankcase

*Vijay*



# BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Automotive Skill

Session: 2021-22 (Summer Semester)

B. Voc., 1<sup>th</sup> Semester

2<sup>nd</sup> In-Sem Examination

Course Code : AUT1102

Time : 1 Hour

Course Name: Automotive wheel care  
and steering system

Max. Marks : 20

## Instructions:

1. Answer all questions from section A, each question carries one mark.
2. Answer all questions from section B, each question carries two mark.
3. Answer all questions from section C, each question carries three mark.

## Section – A

05X01 = 05 Marks

1. What safety Equipment is used to protect lungs from poisonous gas?
  - a. Dust mask
  - b. Respirator mask.
  - c. N 95 mask.
  - d. None of the above.
2. What is the use of universal joint in steering column?
  - a. For Aesthetics.
  - b. For higher efficiency.
  - c. For prevention from accident.
  - d. All of the above.
3. Why treads are made on the tire?
  - a. For grip
  - b. For aesthetic
  - c. Road terrain
  - d. Option A and B
4. What does “Seiton” means in 5s?
  - a. clearing.
  - b. Set in order.
  - c. standardize.
  - d. None of the above.
5. Is there any difference between C joint and universal joint?
  - a. Yes
  - b. No



## BHARTIYA SKILL DEVELOPMENT UNIVERSITY

### Section – B

03X02 = 06 Marks

1. What are the components use in steering column? Draw a diagram of steering system.
2. What are the main function of steering system?
3. Name two types of steering system

### Section – C

03X03 = 09 Marks

1. Explain the physics behind Pascal's law.
2. Explain the working principle of hydraulic steering system with diagram.
3. Explain castor, camber and toe angle.

*Vijay*



School of Automotive Skill

Session: 2021-22 (Summer Semester)

B. Voc., 1<sup>th</sup> Semester2<sup>nd</sup> In-Sem Examination

Course Code : AUTM02

Time : 1 Hour

Course Name: Automotive wheel care  
and steering system

Max. Marks : 20

**Instructions:**

1. Answer all questions from section A, each question carries one mark.
2. Answer all questions from section B, each question carries two mark.
3. Answer all questions from section C, each question carries three mark.

**Section – A**

05X01 = 05 Marks

1. What safety Equipment is used to protect lungs from poisonous gas: -
  - a. Dust mask
  - b. Respirator mask.**
  - c. N 95 mask.
  - d. None of the above.
2. What is the use of universal joint in steering column?
  - a. For Aesthetics.
  - b. For higher efficiency.
  - c. For prevention from accident.**
  - d. All of the above.
3. Why treads are made on the tire?
  - a. For grip**
  - b. For aesthetic
  - c. Road terrain
  - d. Option A and B
4. What does “Seiton” means in 5s?
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  - b. Set in order.**
  - c. standardize.
  - d. None of the above
  - e. .
5. Is there any difference between C joint and universal joint?
  - a. Yes**
  - b. No

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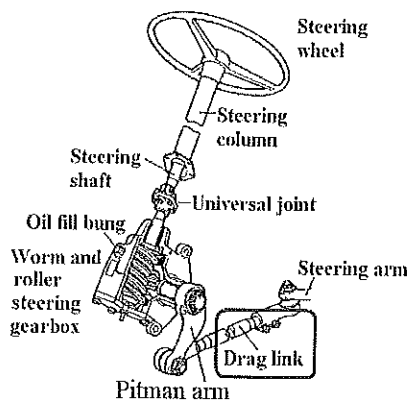
## Section – B

03X02 = 06 Marks

1. What are the components use in steering column? Draw a diagram of steering system.

Ans. Steering Wheel.

- Steering Column & Shaft.
- Universal Joint.
- Steering Gear Box.
- Steering Pump.
- Linkage (Tie Rod).
- Rubber Bush.



2. What are the main function of steering system?

Ans. The primary function of the steering system is to achieve angular motion of the front wheels to negotiate a turn.

- To provide directional stability of the vehicle when going straight ahead.
- To minimize wear and tear of tyres.
- To facilitate straight ahead recovery after completing a turn.
- To providing perfect rolling motion of the road wheels at all times.
- To absorb a major part of the road shocks thereby preventing them to get transmitted to the hands of the driver.

3. Name two types of steering system

Ans. Two types of steering system are as follows:

1. Hydraulic steering system
2. Electric steering system

## Section – C

03X03 = 09 Marks

1. Explain the physics behind Pascal's law?

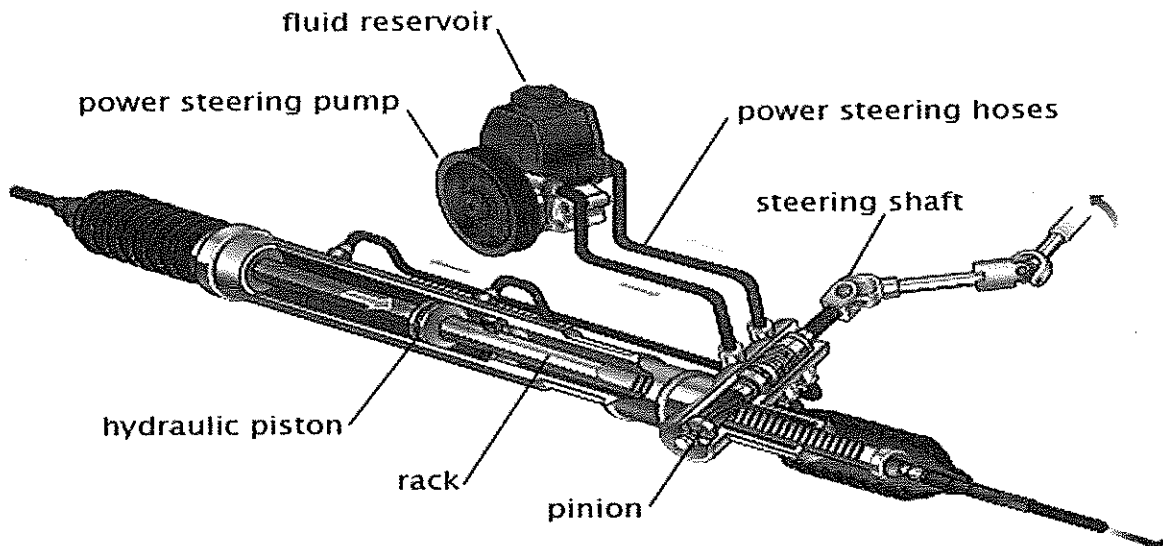
Ans. **Pascal's law** is the basis of **hydraulic** drive systems. As the pressure in the system is the same, the force that the fluid gives to the surroundings is therefore equal to pressure  $\times$  area. In such a way, a small piston feels a small force and a large piston feels a large force.

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2. Explain the working principle of hydraulic steering system with diagram.

Ans. Hydraulic power steering systems work by using a hydraulic system to multiply force applied to the steering wheel inputs to the vehicle's steered (usually front) road wheels. A double-acting hydraulic cylinder applies a force to the steering gear, which in turn steers the roadwheels.

- pressure
- ▨ return



3. Explain caster, camber and toe angle?

Ans. **Caster:**

- This angle shows the forward or backward slope of a line drawn through the upper and lower steering pivot points, when viewed directly from the side of the vehicle.
- Also expressed in degrees, caster is measured by “comparing a line running through the steering system’s upper and lower pivot points to a line drawn perpendicular to the ground,”

**Toe:**

- Identifies the direction tires are pointed relative to the centreline of the vehicle, when viewed from directly above. Toe can be expressed in either degrees or fractions of an inch.

**Camber:** This suspension angle shows how the tire angles away from 0 degrees vertical when viewed from either the front or rear of the vehicle. Expressed in degrees, negative camber means the top of the tire tilts toward the centre of the vehicle, while positive camber means the top of the tire tilts away from centre. A visual cue for a camber problem is excessive tire wear on the inner or outermost ribs.





Registration No.: .....

School of Automotive Skills  
Session: 2021-22 (Summer Semester)  
B. Voc. Program, 1<sup>st</sup> Semester  
2<sup>nd</sup> In Sem. Examination

Course Code: AUT1103

Time: 2 Hours

Course Name: Automotive Body Repair

Max. Marks: 20

Instruction:

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

Section – A

05X01 = 05 Marks

Q1. For GMAW welding..... electrode is used.

- |                   |                      |
|-------------------|----------------------|
| a) Consumable     | c) filler            |
| b) Non-consumable | d) None of the above |

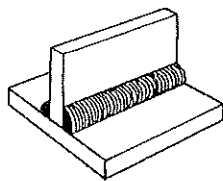
Q2. Plasma is a state of matter consisting of..... gas.

- |                   |             |
|-------------------|-------------|
| a) Hydrogen       | c) Nitrogen |
| c) Carbon dioxide | d) Ionized  |

Q3. The dent which can be removed without any damage of vehicles paints are known as.....

- |                 |                 |
|-----------------|-----------------|
| a) Ding         | c) Scratch      |
| b) Extreme Dent | d) Creased Dent |

Q4. Write the name of the joint type:





## BHARTIYA SKILL DEVELOPMENT UNIVERSITY

- a) Butt Joint
- b) I-Joint
- c) Corner Joint
- d) T-Joint

Q5. Removing pieces from the edges in a sheet is known as.....

- a) Blanking
- b) Slitting
- c) Perforating
- d) Notching

### Section – B

03 × 02 = 06 Marks

Q6. Describe the types of Dent & its removal process.

Q7. Explain brazing and soldering.

Q8. What are the different types of weld joint?

### Section – C

03 × 03 = 09 Marks

Q9. Describe the MIG/MAG welding.

Q10. Explain the process of TIG welding.

Q11. Discuss Sheet Metal shearing process.

*Vijay*



Registration No.: .....

School of Automotive Skills  
Session: 2021-22 (Summer Semester)  
B. Voc. Program, 1<sup>st</sup> Semester  
Answer sheet 2<sup>nd</sup> In Sem. Examination

Course Code: AUT1103

Time: 1 Hour

Course Name: Automotive Body Repair

Max. Marks: 20

Instruction:

1. Attempt all questions.
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Section – A

05X01 = 05 Marks

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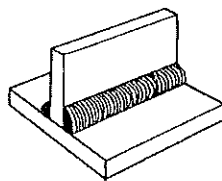
Q2. Plasma is a state of matter consisting of..... gas.

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- |                 |                 |
|-----------------|-----------------|
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# BHARTIYA SKILL DEVELOPMENT UNIVERSITY

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- c) Corner Joint
- d) T-Joint

Q5. Removing pieces from the edges in a sheet is known as.....

- a) Blanking
- b) Slitting
- c) Perforating
- d) Notching

## Section – B

03 × 02 = 06 Marks

Q6. Describe the types of Dent & its removal process.

Ans.

### Types of Dents

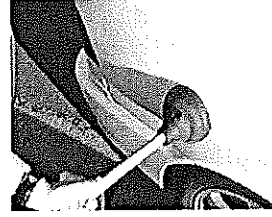
- Car Dings – caused by smaller objects and are easy to repair as long as no damage to the vehicles paint has occurred.
- Round Dents – caused from hailstones or a similarly round object (football, baseball, basketball, etc.) hitting the car and causing a dimple on the door, bumper, roof or hood.
- Crease Type Dents – Crease dents usually bends and tears the car's metal. When an automobile acquires a crease type dent, it is possible to lose the metal memory making it hard to repair back to original shape.



## Paintless Dent Removal

### Household Plunger

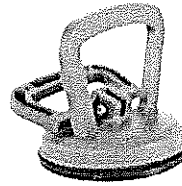
- The removal of basic car dents can be done with the help of a regular plunger with the right technique.
- The method is easier to complete when there are large dents without any holes or creases.



## Paintless Dent Removal

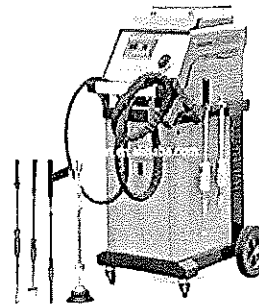
### Car Dent Plunger

There is a wide range of plungers and pullers available at car part stores that are specially designed for car dent removal.



## Dent Puller

- Dent puller is a machine which is used to remove dent by the application of spot weld.



## Mallet

- In the cases where you access to the back of the body part that has suffered the dent, a rubber mallet can be used for the car dent removal.
- If the dents are in a large area, like the hood of the car, you may carefully use the mallet on the reverse side to bring the bodywork back into its place.

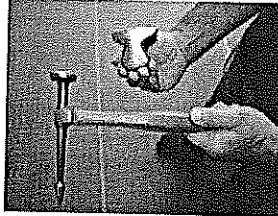




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## Hammer

- A standard metal work hammer can also be used as a technique for car dent removal.
- This method is particularly effective for small and uneven dents.



## Dent Removal Process

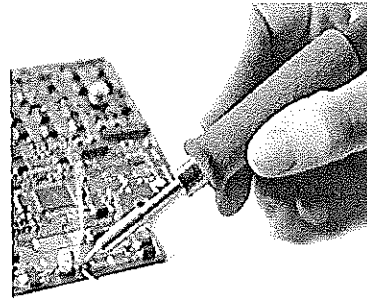
- Remove the paint from dented area using grinder and sand paper.
- Switch on the dent puller.
- Set the voltage and current of dent puller according to the thickness of sheets.
- Set the appropriate attachment according to the type of dent.
- Start removing dents and check in between using sensory method.
- After removing dents, grind the spots of dent puller using grinder.
- And after grinding part is ready for pre-painting.

Q8. Explain brazing and soldering.

Ans.

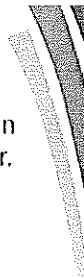
## Soldering

- Soldering is a process in which two or more metal are joined together by melting and putting a filler metal (solder) into the joint, the filler metal having a lower melting point than the parent metals.



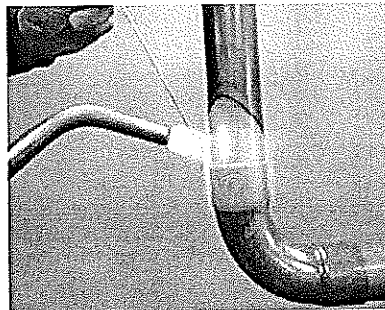
## Soldering

- Soldering is normally done by melting the solder with a soldering iron and applying it to the two metals that are going to be joined together.
- The filler metal used in the process is called solder.
- Soldering is done temperature below 450°C



## Brazing

- Brazing is when a filler metal or alloy is heated to its melting temperature above 450 °C.
- In this case only filler metal melts, there is no melting of work piece metal.
- But this process need preheating of base metal.



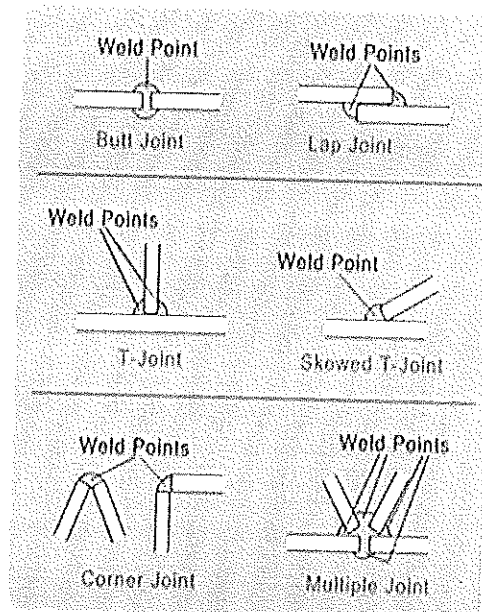
Q8. What are the different types of weld joint?

Ans.



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- The area in which the work pieces are welded together is referred to as a joint.
- Depending on the position of the parts relative to one other, weld joints are identified as:
  - Butt joint
  - Lap joint
  - T-Joint
  - Skewed T-Joint
  - Corner Joint
  - Multiple Joint



### Section – C

03 × 03 = 09 Marks

Q9. Describe the MIG/MAG welding.

Ans.

### MIG Welding

Metal inert gas welding takes its name from the use of inert gases such as argon, helium and mixture of the two gases.

MIG welding is an arc welding process in which a continuous solid wire electrode is fed through a welding gun and into the weld pool, joining two base material together.

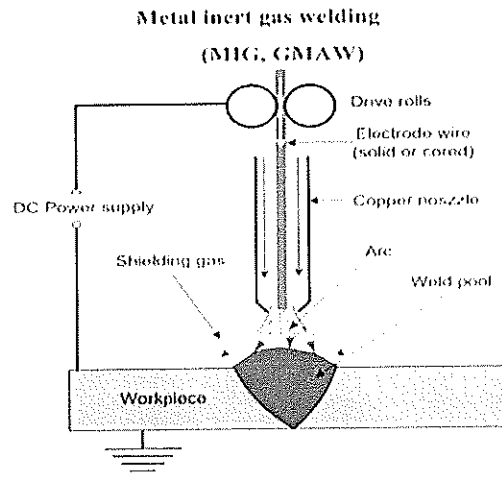
The process is semi-automatic because the electrode and gas are automatically fed through a welding the gun at a user defined speed when the operator pulls down the trigger.

## MAG Welding

Metal active gas welding takes its name from the active welding gas used ( $\text{CO}_2$  or gas mixture (argon containing active gas, two or three components)).

Long and short arc are used during MAG welding.

MAG welding is a steel welding process.

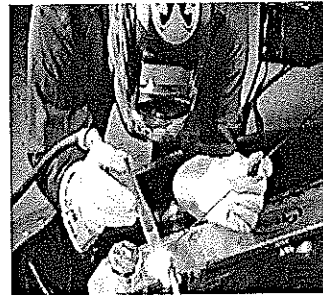


Q10. Explain the process of TIG welding.

Ans

## TIG Welding

- Tungsten Inert Gas Welding (TIG Welding), also known as Gas Tungsten Arc Welding (GTAW).
- It is an Arc welding method that uses a non-consumable tungsten electrode to weld two or more work pieces.
- It is very much similar to Metal Inert Gas (MIG) Welding.
- Commonly used to weld thin sections of stainless steel and non-ferrous metals such as aluminium, magnesium, and copper alloys.

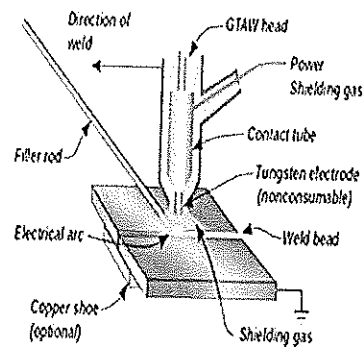


## Working

- The work piece to be weld is placed on the work table.
- The non-consumable tungsten electrode and the work piece are connected to the power supply.
- As the electrode is brought near the work piece (leaving a small air gap), an arc is produced. This is used for melting and welding the work piece.
- Tungsten has high melting point ( $4322^{\circ}\text{C}$ ). Hence tungsten electrode does not melt during the welding process.
- In TIG welding filler rod may or may not be used. The use of filler rod depends up on the nature of work piece to be welded.

## Working

- If filler rod is used, it is continuously melted by the arc and fed into the weld pool.
- The inert gas supply is constantly provided around the electrode during the welding process. The inert gas forms a gas shielding around the weld. It protects the weld from the external atmosphere.



Q11. Discuss Sheet Metal shearing process.

Ans. **Shearing processes** -- processes which apply shearing forces to cut, fracture, or separate the material.

1. **Punching:** shearing process using a die and punch where the **interior** portion of the sheared sheet is to be **discarded**.
2. **Blanking:** shearing process using a die and punch where the **exterior** portion of the shearing operation is to be **discarded**.
3. **Perforating:** punching a number of holes in a sheet
4. **Parting:** shearing the sheet into two or more pieces
5. **Notching:** removing pieces from the edges
6. **Lancing:** leaving a tab without removing any material

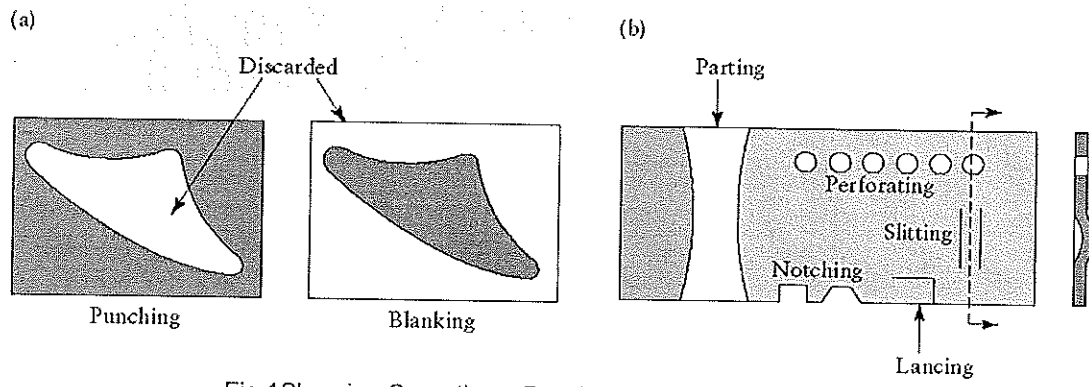


Fig.1 Shearing Operations: Punching, Blanking and Perforating

Vijay





**School of Automotive Skills**  
**Session: 2021-22 (Summer Semester)**  
**B. Voc. Program, 1<sup>st</sup> Semester,**  
**2<sup>nd</sup> In-Sem. Examination**

**Course Code: AUT1104**

**Time: 1 Hour**

**Course Name: Automotive Spray Painting**

**Max. Marks: 20**

**Instruction:**

1. Answer all questions from section – A, each question carries one mark.
2. Attempt all questions from section – B, each question carries two marks.
3. Answer all questions from section – C, each question carries three marks.

**Section – A**

05X01 = 05 Marks

Q1. The equipment which is used to purify the breathing air inside a paint booth is known as:

- a) Mask & Respirator.
- b) Earplugs.
- c) Hand Gloves.
- d) Safety Goggles.

Q2. Which type of sanding process is recommended by OEM for refinish painting?

- a) Dry Sanding.
- b) Wet Sanding.
- c) Both of the above.

Q3. The equipment used to spread the putty on the surface during surface preparation is known as:

- a) Sand Block.
- b) Dent Puller.
- c) Putty Spreader Sheet.
- d) Dry Sander.

Q4. Which sand paper is coarser from the following?

- a) P800.
- b) P180.
- c) P600.
- d) P80.



Q5. Body filler is applied over.....

- a) Base Coat.
- b) Clear Coat.
- c) Base Metal.
- d) Primer Surfacer.

**Section – B**

03X02 = 06 Marks

Q6. Write a short note on:

- a. DFT.
- b. Sander.

Q7. Write about the tools and equipment used in automotive paint shop.

Q8. Explain what is 5S?

**Section – C**

03X03 = 09 Marks

Q9. Write down the steps of putty application and putty sanding process.

Q10. What are the major responsibilities of a paint technician in an automotive workshop?

Q11. What is sanding? Explain types of sanding.

*Vijay*



**School of Automotive Skills**  
**Session: 2021-22 (Summer Semester)**  
**B. Voc. Program, 1<sup>st</sup> Semester,**  
**2<sup>nd</sup> In-Sem. Examination**

**Course Code: AUT1104**

**Time: 1 Hour**

**Course Name: Automotive Spray Painting**

**Max. Marks: 20**

**Section – A**

05X01 = 05 Marks

Q1. The equipment which is used to purify the breathing air inside a paint booth is known as:

Answer: a. Mask & Respirator.

Q2. Which type of sanding process is recommended by OEM for refinish painting?

Answer: a. Dry Sanding.

Q3. The equipment used to spread the putty on the surface during surface preparation is known as:

Answer: c. Putty Spreader Sheet.

Q4. Which sand paper is coarser from the following?

Answer: d. P80.

Q5. Body filler is applied over.....

Answer: c. Base Metal.

**Section – B**

03X02 = 06 Marks

Q6. Write a short note on:

- a. DFT.
- b. Sander.

Answer:

(a) It is a coating thickness gauge used to measure dry film thickness. It is most critical measurements because of its impact on the coating process, quality and cost.

A coating thickness gauge (also referred to as a paint meter) is used to measure dry film thickness. Dry film thickness measurements can be used to evaluate a coating's expected life, the product's appearance and performance, and ensure compliance with a host of International Standards.

(b) A sander is a tool that's used to smooth a vehicle's surface before painting. Sanders are useful for a variety of tasks, including removing old paint and varnish, buffing, and polishing.



There are three primary types of sanders for cars:

- Air sanders.
- Hand sanders.
- Electric sanders.

Components of sander:

1. Sanding Pad.
2. Air Regulator.
3. Trigger.
4. Air Inlet.
5. Comfort Grip.

Q7. Write about the tools and equipment used in automotive paint shop.

Answer:

### **1. Paint booth**

Paint booths are walled structures used to safely contain painting and other finishing processes. • Paint booths are present in a variety of industries including automotive, aviation, manufacturing, millworks, and many more.

In general, there are two types of paint booths:

- Non-ducted (open face)
- Directly ducted (enclosed)

### **2. Paint mixing room:**

Paint mixing room is a place where we mix the paints according to the requirements. It should have colour-corrected artificial lighting and downdraft ventilation. Paint mix rooms are generally located next to the spray booth to maximise painter productivity.

### **3. Spray guns:**

The spray gun is the most popular type of spray application equipment use. A spray gun is a tool which uses compressed air to atomise paint and to apply it to a surface. Air and material enter the gun through separate passages and are mixed at the air cap in a controlled pattern.

- Air nozzle assembly
- Gravity feed cup
- Gun body
- Side port control
- Fluid control knob
- Air connection

### **4. Air compressor:**

An air compressor is a device that stores energy in the form of compressed air. It converted compressed air back to mechanical energy when using air tools. In its basic form, an air compressor has a storage tank, a motor, and pump.



## 5. Infrared dryer:

It is a radiant energy/ electromagnetic radiation like X-rays and UV rays. It is divided into three parts: -

- Short wave: - less than 2 microns.
- Medium wave: - between 2 and 4 microns.
- Long wave: - above 4 microns.

## 6. Dry film thickness meter:

It is a coating thickness gauge used to measure dry film thickness. It is most critical measurements because of its impact on the coating process, quality and cost.

## 7. Sander:

A sander is a tool that's used to smooth a vehicle's surface before painting. Sanders are useful for a variety of tasks, including removing old paint and varnish, buffing, and polishing.

There are three primary types of sanders for cars:

- Air sanders.
- Hand sanders.
- Electric sanders.

Q8. Explain what is 5S?

Answer:

5 Japanese principles:

- All the words begin with an S
- The construction and installation on a long-term basis of an instantaneous visual control system
- Improving the effectiveness of the working environment in all areas of the dealership.

## 5S Explanation



Sort      Set in Order      Shine      Standardize      Sustain

When in doubt, move it out – Red Tag technique	A place for everything and everything in its place	Clean and inspect or Inspect through cleaning	Make up the rules, follow and enforce them	Part of daily work and it becomes a habit
--	--	---	--	---

- Neat & clean workplace
- Smooth working



No obstruction

- Safety increases
- Productivity improves
- Quality improves
- Wastage decrease
- Machine maintenance
- Visual control system
- Employees motivated
- Workstations become spacious

## Section – C

03X03 = 09 Marks

Q9. Write down the steps of putty application and putty sanding process.

Answer:

Putties are generally applied with a “knife” in a relatively heavy to very heavy layer thickness to the substrate in order to fill larger / deeper damaged areas. Polyester stopper/putty is basically a filler for indentations or Dents in a panel.

This material is a two component material requiring the addition of a peroxide hardener to convert the paste into a solid matter.

After hardening stopper/putty can be dry sanded to form a very fine smooth and level surface which reproduces the original surface appearance before the damage occurred

1. Mix Putty & Hardener - (1% - 3%) of hardener may be needed depending upon Season & Temperature.
2. Mix the stopper/putty well avoiding excessive air being included (slow firm blending together).
3. Once mixed (even colour) apply quickly to the surface
4. Apply to the clean surface with a firm action.
5. The angle of your spreader determines the thickness of application. A maximum of 1 millimetre thickness should be observed. Can be sanded dry
6. After Drying the Putty can be sanded Dry initially with a coarse paper (P80) moving to finer (P180)
7. Mix the stopper/putty well avoiding excessive air being
8. included (slow firm blending together)
9. Polyester/putty is very porous and water will be absorbed giving the possibility of blistering at a later date.
10. Wet sanding of stopper/putty may also cause “flash-rusting” of the metal surface which may continue to corrode even after painting.
11. Wet sanding is harmful in Putty.
12. Coarse sanding paper produces large scratches which must be removed progressively
13. Only apply putty on corrosion free substrates
14. Never wet sand putty as it is very hydroscopic (water absorbing)



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15. Apply in thin layers and avoid excessively thick applications as this can lead to problems with adhesion and flexibility
16. Remove dust from any craters in the surface before re applying putty or Primer & Filler coats

Q10. What are the major responsibilities of a paint technician in an automotive workshop?

Answer:

1. To carry all types of vehicle body refinishing work like:
  1. Pre -paint preparation
  2. Priming and painting
  3. Paint inspection
  4. Rectification of defects
2. To identify and utilize the correct methods of working by using your experience, skills, training and industry knowledge,
3. To keep your skills up-to-date by making appropriate efforts to acquire adequate knowledge of new vehicles.
4. To identify and report all apparent faults considered to be advisable in the interest of safety and reliability.

Q11. What is sanding? Explain types of sanding.

Answer:

Sanding removes the top layer of your car's paint using abrasive materials. It also helps to make the surface even after the putty application by removing extra putty from the surface.

1. Function of sanding in car repair:
  - a. Removal of material.
  - b. Preparation of surfaces (adhesion promoter).
  - c. Smoothing and surface embellishment.
  - d. Reparation of defects.
2. Types of sanding:
  - a. Manual sanding.
    - i. Wet sanding.
    - ii. Dry sanding.
  - b. Automatic sanding.

Manual sanding: Manual or hand sanding is the oldest known method of sanding used. It only uses when the machine cannot be used, such as sanding small and hard surfaces access, etc.

The hand sanding can be done using 2 techniques:

- Water sanding or wet sanding.
- Dry sanding.



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Water sanding: Water or wet sanding is done by immersing the sandpaper in a bucket of water. It produces less dust, longer life of the sandpaper and allows obtain a smooth surface compared with dry sanding.

Dry sanding: Dry sanding is applied directly on the surface. This type of sanding causes excessive dust resulting abrasive action of the grain on the surface.

Automatic sanding is done by sanding machines called as sanders. Greatly reduces the effort and time of work compared to hand sanding. The main disadvantage is that sanders not arrive well in difficult areas or edges, where it is necessary sand by hand.

Important points to remind before starting sanding work:

- Clean/degrease the surface.
- Select the properly sandpaper (more or less abrasive) that fits to the work.

*Vijay*



**School of Automotive Skills**

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

**B. Voc. Program, 1<sup>st</sup> Semester,**

**2<sup>nd</sup> In-Sem. Examination**

**Course Code: AUT1105**

**Time: 1 Hour**

**Course Name: Automotive Electrical Fundamentals & A. C.**

**Max. Marks: 20**

**Instruction:**

1. Answer all questions from section – A, each question carries one mark.
2. Attempt all questions from section – B, each question carries two marks.
3. Answer all questions from section – C, each question carries three marks.

**Section – A**

05X01 = 05 Marks

Q1. The change in physical state of refrigerant in evaporator is:

- a) From Vapour to Liquid.
- b) From Liquid to Vapour.
- c) Stays in Vapour state.
- d) Stays in Liquid state.

Q2. Which type of compressor is majorly used in a passenger car's refrigeration system?

- a) Centrifugal.
- b) Reciprocating.
- c) Rotary.
- d) Axial.

Q3. In a small refrigeration system, the expansion device is connected between the:

- a) Compressor & Condenser.
- b) Condenser & Evaporator.
- c) Evaporator & Condenser.
- d) Accumulator & Evaporator.

Q4. Which refrigerant is used in an Automotive A.C. System?

- a) R-22.
- b) R-32.
- c) R-134a.
- d) R-410a.



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Q5. Power is directly proportional to:

- a) Work.
- b) Time.
- c) Force x Time.
- d) None of the above.

## Section – B

03X02 = 06 Marks

Q6. Write down the advantages and disadvantages of VCRS over Air Refrigeration System.

Q7. What are the different types of expansion devices are used in an automotive vehicle?

Q8. Write down the properties of R-134a as a refrigerant used in automotive vehicles.

## Section – C

03X03 = 09 Marks

Q9. Explain the following refrigerants and their properties:

- a. HFC.
- b. FC.
- c. HCFC.
- d. CO<sub>2</sub>.
- e. NH<sub>3</sub>.
- f. HC.

Q10. Define AC Compressor, Condenser & Evaporator in detail.

Q11. Write down the steps to identify the faults in an AC system performance & explain them in detail.

*Vijay*



**School of Automotive Skills  
Session: 2021-22 (Summer Semester)  
B. Voc. Program, 1<sup>st</sup> Semester,  
2<sup>nd</sup> In-Sem. Examination**

**Course Code: AUT1105**

**Time: 1 Hour**

**Course Name: Automotive Electrical Fundamentals & A. C.**

**Max. Marks: 20**

**Section – A**

05X01 = 05 Marks

Q1. The change in physical state of refrigerant in evaporator is:

Answer: b) From Liquid to Vapour.

Q2. Which type of compressor is majorly used in a passenger car's refrigeration system?

Answer: c) Rotary.

Q3. In a small refrigeration system, the expansion device is connected between the:

Answer: b) Condenser & Evaporator.

Q4. Which refrigerant is used in an Automotive A.C. System?

Answer: c) R-134a.

Q5. Power is directly proportional to:

Answer: a) Work.

**Section – B**

03X02 = 06 Marks

Q6. Write down the advantages and disadvantages of VCRS over Air Refrigeration System.

Answer:

Advantages:

- Size is small when compared to an air refrigeration system for a given capacity of refrigeration.
- Volume of refrigerant circulated is low. Hence the running cost is low.
- High coefficient of performance.
- The operating temperature range is huge.
- The temperature at the evaporator can be easily controlled by regulating expansion valve.
- It requires smaller evaporator.

Disadvantages:

- High initial cost, costly refrigerant.
- Environmental hazardous refrigerant involved.
- Must ensure the prevention of leakage of refrigerant.



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Q7. What are the different types of expansion devices are used in an automotive vehicle?

Answer:

- a. Capillary Tube.
- b. Thermal Expansion Valve (TXV).
- c. Electronic Expansion Valve.

Q8. Write down the properties of R-134a as a refrigerant used in automotive vehicles.

Answer:

- It is non-toxic, non-flammable & non-corrosive.
- It has a boiling point of -15.34 Degree Fahrenheit or -26.3 degree Celsius.
- It has a high heat of vaporization.
- Its auto ignition temperature is 770 degrees Celsius.
- Universally accepted cylinder code for R134a is light blue.
- It has a moderate density in liquid form, etc.

## Section – C

03X03 = 09 Marks

Q9. Explain the following refrigerants and their properties:

- a. HFC.
- b. FC.
- c. HCFC.
- d. CO<sub>2</sub>.
- e. NH<sub>3</sub>.
- f. HC.

Answer:

- a. HFC: HydroFluoroCarbons

The hydrofluorocarbons are refrigerants that contain no chlorine and are not harmful to the ozone layer. However, their impact on global warming is very large compared with traditional refrigerants. The most common HFC refrigerants available since the ban on HCFCs are presented.

- b. FC: FluoroCarbons

Fluorocarbons contain no chlorine and are not harmful to the ozone layer. However, they are extremely stable, and they have a high GWP. R218 is an example of a fluorocarbon, and FCs are also present in the mixtures R403 and R408.

- c. HCFC: HydroChloroFluoroCarbons

The slow phase-out of CFCs shows it is a costly process. However, and more importantly, it also shows the problems and indecisiveness surrounding the availability of HCFCs, which were officially indicated as temporary (until 2030) substitutes for CFCs. The hasty actions of the European Union that culminated in the ban of HCFCs, immediately for refrigeration and soon (2004 at the latest) for air conditioning, has upset the industry's programs and plans.



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The HCFCs contain less chlorine than CFCs, which means a lower ODP. Examples of hydrochlorofluorocarbons include R22, R123 and R124.

### d. CO<sub>2</sub>: Carbon Dioxide

R744, carbon dioxide, has several attractive characteristics: non-flammable, does not cause ozone depletion, very low toxicity index (safety A1), available in large quantities, and low cost. However, it also has a low efficiency and a high operating pressure (approximately 10 times higher than R134a). For the two latter reasons, efforts are needed to improve its refrigeration cycle and related technology, particularly heat exchangers and expansion devices. A major forthcoming CO<sub>2</sub> application seems to be air conditioning in the automotive industry. Heat pumps could also benefit from CO<sub>2</sub> due to the higher temperature that can be obtained even at very low ambient temperatures.

### e. NH<sub>3</sub>: Ammonia

Ammonia, R717, is an attractive refrigerant alternative. It has been used in refrigeration systems since 1840 and in vapour compression since 1860. In terms of its properties, it should be considered a high-class refrigerant. Furthermore, its ODP and GWP are 0. However, although it is a self-alerting gas, i.e. leaks can easily be detected by the smell, ammonia is very hazardous even at low concentrations because the smell often causes panic. This is the main reason why ammonia was withdrawn from applications for use by unskilled people and retained only for industrial applications.

It is also quite common in commercial refrigeration, although safety regulations require that it be used with a secondary distribution loop. Obviously, this secondary loop reduces the efficiency.

### f. HC: HydroCarbons

Hydrocarbons are a very limited solution to the environmental problems associated with refrigerants. They are harmless to the ozone layer (ODP = 0) and have hardly any direct greenhouse effect (GWP < 5), but they are highly flammable. The use of HCs as refrigerants is confined to Europe, because many other countries elsewhere have banned the use of flammable gas in the presence of the public. According to the standards ISO 55149 and EN 378.2000, this should apply also in Europe. However, the standard IEC 355.2.20 allows the use of HCs in household refrigerators with refrigerant charges up to 150 g.

This standard has opened the way for some European refrigerator manufacturers to produce household refrigerators with flammable isobutene, R600a.

These have been accepted enthusiastically by environmentalists, and have achieved great success in the market.

Q10.

Answer:

- a. The function of a compressor is to remove the vapour produced by the evaporator and to deliver it at a required higher pressure. The compressor can be compared to a heart pumping the blood (the refrigerant) inside the body (the compression cycle). In the



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basic compression cycle, the compressor is positioned between the evaporator and the condenser. Compressors can be installed in either single or multistage configuration, and can be connected to each other in series or in parallel. The compressor is one of the most important parts of your air conditioning unit. Not only does the compressor play an important role in the cooling process, but it also ensures that the unit works effectively and continually. Compressor Location: The compressor can be found under the hood (Bonnet) of the vehicle, near to the belt drive.

### Types of Compressors:

- Positive Displacement Compressor (reduction in volume due to a piston in thermodynamics is considered as positive displacement of the piston).
  - Reciprocating or piston type compressor.
  - Screw compressor.
  - Scroll compressor.
  - Rotary compressor.
- Dynamic compressor.
  - Centrifugal or turbo compressor.

b. In systems involving heat transfer, a condenser is a device or unit used to condense a gaseous substance into a liquid state through cooling. In so doing, the latent heat is released by the substance and transferred to the surrounding environment. Condensers are used for efficient heat rejection in many industrial systems. Condensers can be made according to numerous designs, and come in many sizes ranging from rather small (hand-held) to very large (industrial-scale units used in plant processes). For example, a refrigerator uses a condenser to get rid of heat extracted from the interior of the unit to the outside air.

Condensers are used in air conditioning, industrial chemical processes such as distillation, steam power plants and other heat-exchange systems. Use of cooling water or surrounding air as the coolant is common in many condensers.

### Types of Condensers:

- Air-cooled Condenser.
  - Water-cooled Condenser.
  - Evaporative Condenser.
- c. An evaporator is a device in a process used to turn the liquid form of a chemical substance such as water into its gaseous-form/vapour. The liquid is evaporated, or vaporized, into a gas form of the targeted substance in that process.

The air-conditioning evaporator is a small radiator inside the dashboard that provides cold air for the air-conditioning system. It's called the evaporator because it's where the freezing liquid refrigerant takes on any heat from the air blown through it and changes into a gaseous state (evaporating it) before returning it to the air-conditioning condenser to shed the heat; the process is constantly repeated. The air that emerges from the air conditioner is cold as a result.



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The evaporator is typically hidden inside the vehicle's dashboard and can be labour-intensive to replace, which then requires a full system recharge. Unlike a ruptured heater core, which can leak engine coolant into the foot wells, a leak in the evaporator releases only refrigerant vapour. A clogged drainage channel is a common cause of water in the front foot wells.

Types of Evaporator:

- Natural/forced Circulation Evaporator.
- Falling Film Evaporator.
- Rising Film (Long Tube Vertical) Evaporator.
- Climbing and Falling-film Plate Evaporators.
- Multiple Effect Evaporators.
- Agitated Thin Film Evaporator.

Q11. Write down the steps to identify the faults in an AC system performance & explain them in detail.

Answer:

- Weak Airflow.
- Warning Lights Alert.
- A/C isn't cold as it is used to be.
- A/C starts out cold then starts getting warm.
- Unpleasant odour coming from the system.
- A/C system leakage.

### **Why does my A/C have weak airflow?**

Main causes of weak airflow:

Mold or mildew may have accumulated in the evaporator core from residual moisture that occurs during the cooling process. When this happens, air will have trouble reaching your air vents.

A hose has come loose. This usually happens with the blower hose that supplies air to the blower unit.

Ventilation fan is fried. If the fan's not blowing, air won't be flowing very well.

Seals. No, not those seals down by the pier. Core case seals, blower house seals or evaporator core case seals; All can open up and diminish air flow. A/C ventilation systems are very sensitive and must remain sealed. Once they're opened, the whole system is compromised.

### **Is there any system warning lights to alert me to an A/C problem?**

Typically, no, but some vehicles have Driver Information Centers (DIC) that may display the status of many vehicle systems. Refer to your Owner's Manual for more information.

My A/C isn't as cold as it used to be, what's going on?

The lack of precious cold air could be caused by:

A Freon leak caused by a failed O-ring, seal, hose or component



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A/c clogged expansion tube or refrigerant charging hose

Failed compressor or compressor clutch

Failed blower motor or blower motor resistor

Damaged or failed condenser or evaporator

Vacuum leaks

Failed switch, fuse, relay, control module, blend door or solenoid

## **The A/C starts out cool then starts getting warm, what's happening?**

From cold to hot and all the symptoms in between:

The clogged expansion valve: The expansion valve distributes the proper amount of refrigerant to your evaporator. If the valve is blocked, the refrigerant can't flow into the evaporator. With the valve clogged, the refrigerant will start to freeze the valve altogether if moisture is present.

Faulty compressor clutch: If the clutch is not engaging with your compressor, then your compressor can't maintain the correct pressure. Hot air will result.

The blown fuse scenario: Fuses sometimes short out. If the fuse associated with your A/C system goes, the power to certain parts will stop.

Leaks are an A/C system's worst friend: Leaks are the result of damage or the presence of moisture. When moisture and refrigerant mix, nasty corrosive acids will eat away at seals and components, causing a leak.

## **What is the smelly, gym locker odour coming from my A/C vents?**

Sounds like you have an odorific problem on your hands. There are a few issues that may be causing this smell.

Potential causes of nasty "gym locker" odours:

Dirty and old air cabin filter.

Moldy evaporator case. A problem for many vehicles when water sits in the evaporator case because the case's drain is blocked. Mold will accumulate.

## **How do you test for an A/C system leak?**

While we're no C.S.I. unit, the ways to detect an A/C system leak are not far off from an episode of the ever popular investigation show.

Detecting leaks:

Black light enabled dyes. You read that right. A lot of refrigerants are pre-mixed with a special U.V. dye that shows up under black light. We'll run a black light over your A/C system to see if any dye shows up.

Bring in the "sniffer." A sniffer is a special device that hones in on the refrigerant's chemical components. If there's a leak, our sniffer will sniff it out.

## **What causes an A/C system leak?**

Age and moisture. Plain and simple. Rubber seals and hoses can also lose their elasticity over time and breakdown allowing Freon to escape and moisture to enter your vehicle's A/C system. Moisture is the kiss of death for your A/C system, mixing with refrigerant and creating a system destroying corrosive acid.



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School of Automotive Skills  
1<sup>st</sup> Semester, 2<sup>nd</sup> In-Sem. Examination  
B. Voc. Program, Summer Semester (2021-22)

Course Code: AUT1106

Time: 1 Hour

Course Name: Automotive tools and measurement

Max. Marks: 20

### Instructions:

1. Attempt all questions from section-A and each question carries 1 mark.
2. Attempt all questions from section-B and each question carries 2 marks.
3. Attempt all questions from section-C and each question carries 3 marks.

### Section – A

05X01 = 05 Marks

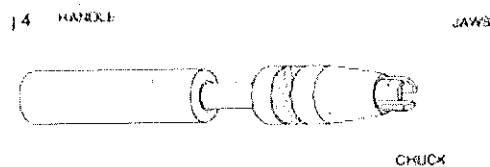
Q1. \_\_\_\_\_ is angle between the top face of cutting point and normal to work surface at cutting edge

- a. Clearance angle
- b. Point angle
- c. Rake angle
- d. None of the above

Q.2 The least count defines the.....

- a. Smallest unit we can measure
- b. Smallest dimension
- c. Smallest length
- d. None of these

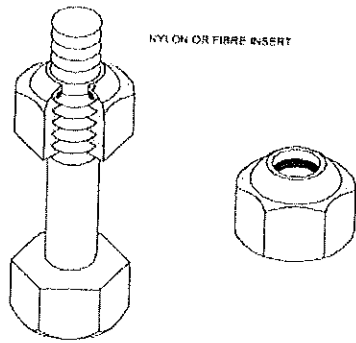
Q.3 Name the equipment;



- a. Pin vice
- b. Measuring Gauge
- c. Both (A) & (B)
- d. None of the above

## BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Q.4 Name the type of nut:



- a. Self lock nut
- b. T-Nut
- c. Square nut
- d. None of the above

Q.5 This type of bolt is used when the assembly is subjected to alternating load condition continuously;

- a. Anti-Fatigue Bolts
- b. Body fit Bolts
- c. Studs
- d. None of the above



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School of Automotive Skills  
1<sup>st</sup> Semester, 2<sup>nd</sup> In-Sem. Examination  
B. Voc. Program, Summer Semester (2021-22)  
Answersheet

Course Code: AUT1106

Time: 1 Hour

Course Name: Automotive tools and measurement

Max. Marks: 20

### Instructions:

1. Attempt all questions from section-A and each question carries 1 mark.
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### Section – A

05X01 = 05 Marks

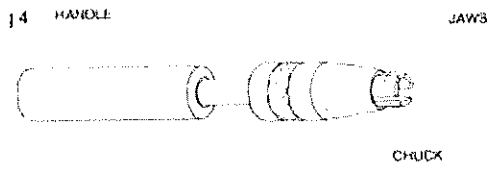
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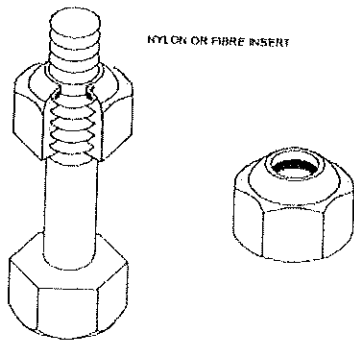
Q.3 Name the equipment



- a. Pin vice
- b. Measuring Gauge
- c. Both (A) & (B)
- d. None of the above

## BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Q.4 Name the type of nut



- a. Self lock nut
- b. T-Nut
- c. Square nut
- d. None of the above

Q5. This type of bolts is used when the assembly is subjected to alternating load condition continuously.

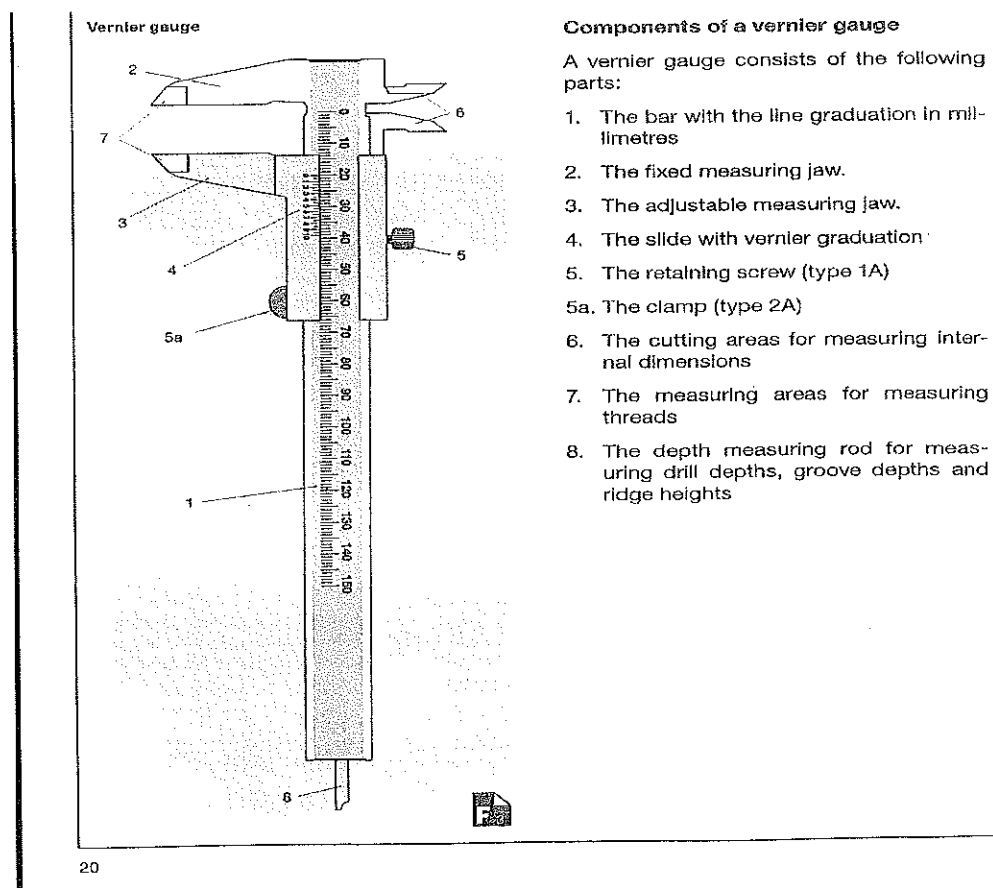
- a. Anti-Fatigue Bolts
- b. Body fit Bolts
- c. Studs
- d. None of the above

Section – B

03X02 = 06 Marks

Q6. Explain the parts of Vernier caliper with diagram.

Ans.



Q.7 Explain Purpose of chisel, its parts and types of chisel.

Ans. The cold chisel is a hand cutting tool used by fitters for *chipping* and cutting off operations

- Chipping is an operation of removing excess metal with the help of a chisel and hammer

- Chip surface being rough should be finished by filing

• A Chisel has following parts:

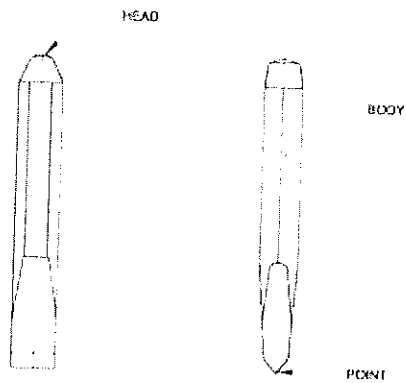
Head

Body

Point or cutting edge

- Chisels are made from High carbon steel, Chrome vanadium steel

- The cross section of chisels is usually hexagonal or octagonal



### TYPES OF CHISELS

•Common types of Chisels are:

- Flat Chisel
- Cross Cut or Cape Chisel
- Half Round Nose Chisel
- Diamond Point Chisel
- Web or Punching Chisel

Q8. Write Different types of nuts and bolts.

Ans.

There are different types of nut:

- Hexagonal nuts
- Square nuts
- Self-locking nuts
- T- nuts
- Slotted & Castle nuts
- Round nuts
- Slotted Round nuts

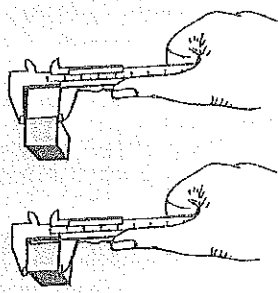
Depending upon type of application, different types of bolts are used:

- Bolts with clearance hole
- Body fit bolt
- Anti-fatigue bolt
- Studs

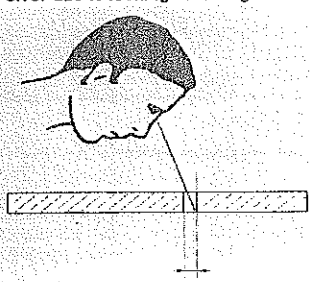
Q.9 Write short note on measuring errors.

Ans.

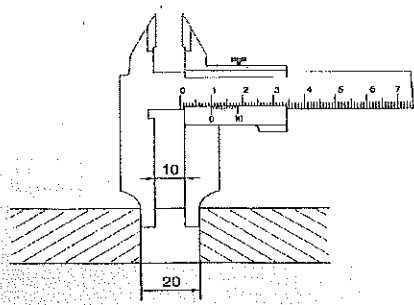
**Measurement errors**



**Reading error due to looking at an angle**



**Reading error affecting measurement of Internal dimension**



**4.1.2 Measurement errors**

- ▶ The parallelism of the measuring jaw of the vernier gauge is checked using the light gap method.
- ▶ The accuracy of the measuring tools is dependent upon the reference temperature (20°C).
- ▶ Workpieces/measuring depths must be clean and burr-free for measuring.
- ▶ The measuring jaws must be directed as high as possible above the work-piece.
- ▶ Do not tilt the vernier gauge during measuring.
- ▶ Do not apply too much pressure when pressing the moving measuring jaw against the surface to be measured.
- ▶ Look at the reading from above.
- ▶ The vernier gauge is a precision measuring tool and must therefore be protected against soiling and damage.

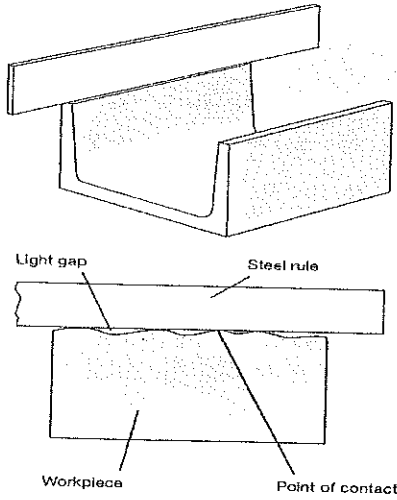
▶ **Measuring internal dimensions**

With the vernier gauge shown, the thickness of the measuring jaw must always be added to the reading; i.e. the value read off is not the measured value.

Q.10 What is light gap method, explain work technique of radius gauge.

Ans.

**Light gap method**



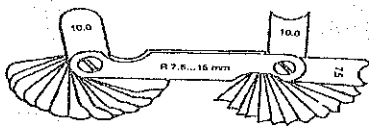
**The light gap method**

The light gap method is used to check surface evenness. The method involves placing a steel rule perpendicular on the surface to be checked.

Hold the workpiece up against a light source with the steel rule at eye level. A light gap will appear where there are recesses.

To achieve an even surface, file down the problem areas identified.

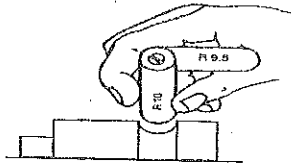
**Radius gauge**



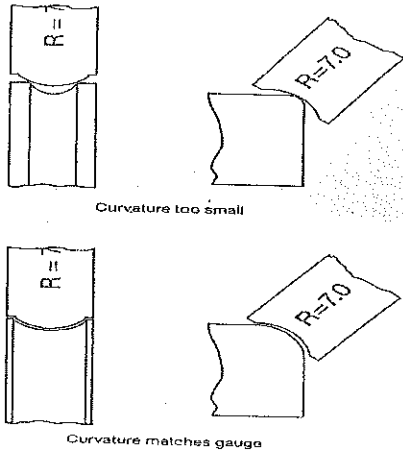
**Radius gauge (radius template)**

Grooves and raised external radii are checked with a radius template. The rounding of the test part is compared with the corresponding profile of the gauge. The check uses the light gap method. With a radius gauge, the radius is indicated in "millimetres" on a metal template. The radius template is referred to as a gauge since each template only has a single measurement.

**Internal radius**



**Work technique**



**Work technique**

Curvatures which are part of circles are checked with radius gauges. During the check, the gauge is held at right angles to the workpiece. The light gap makes errors visible.

The terms external radius and internal radius are used in technical language.

An external radius is arched outwards or raised (convex).

An internal radius is arched inwards or hollow (concave).

Q.11 Write different angles of chisel and their effects.

Ans.

**Point Angle:**

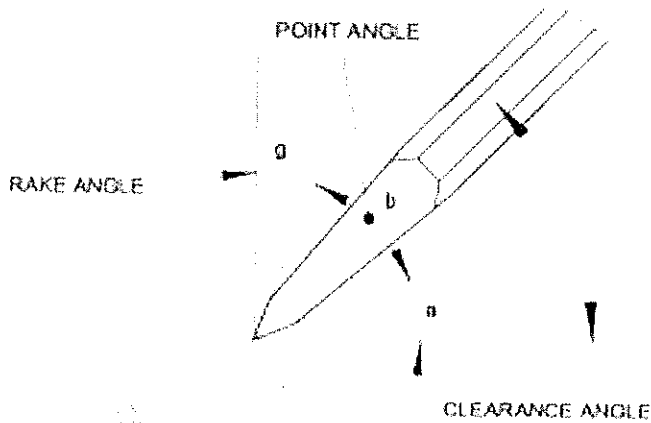
•Correct point/cutting angles of chisel depends on the material to be chipped, sharp angles for soft materials and wide angles for hard materials

•**Rake Angle:**

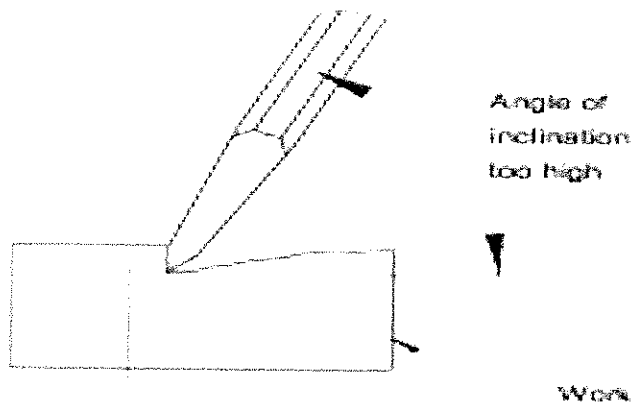
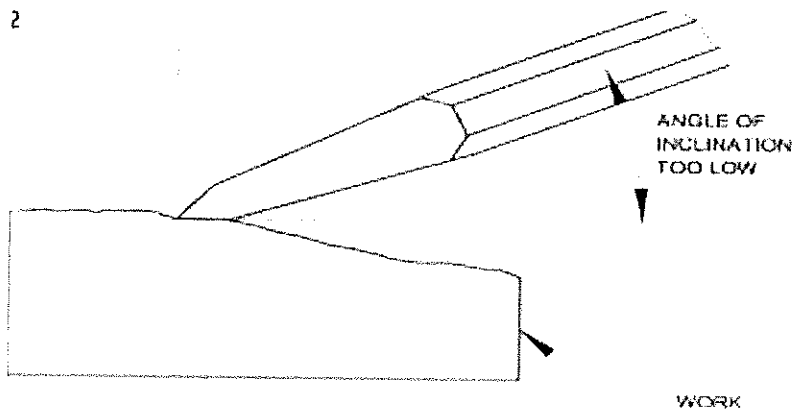
•Rake angle is angle between the top face of cutting point and normal to work surface at cutting edge

•**Clearance Angle:**

•Clearance angle is angle between the bottom face of point and tangent to the work surface originating at the cutting edge



2



Effects -

- Angle of Inclination too low, Rake angle increases cutting edge cannot penetrate into work-piece

*Vijay*



**Section – B**

**03X02 = 06 Marks**

Q6. Explain the parts of Vernier caliper with diagram.

Q.7 Explain Purpose of chisel, its parts and types of chisel.

Q8. Write Different types of nuts and bolts.

**Section – C**

**03X03 = 09 Marks**

Q.9 Write short note on measuring errors.

Q.10 What is light gap method, explain work technique of radius gauge.

Q.11 Write different angles of chisel and their effects.

*Vipin*

