



**School of RAC Skills**  
**Session: 2020-21 (Winter Semester)**  
**B. Voc. 1<sup>st</sup> Semester,**  
**1<sup>st</sup> In-Sem. Examination**

**Course Code: RAC1101**

**Time: 1 Hour**

**Course Name: Basics of RAC**

**Max. Marks: 20**

**Instruction:** Write the unit clearly and do mention the steps for calculation.

**Section – A**

05X01 = 05 Marks

Objective type questions, each question carries 01 mark.

Q.1) A body named \_\_\_\_\_ is setup for international acceptance in English?

- a) Conference for SI
- b) General conference in weights and measures
- c) General unit
- d) Unit and measures International

Q.2) Components of Units are

- a) Numerical value and unit
- b) Digits and unit
- c) Magnitude and Unit
- d) a & c options

Q.3) How many Fundamental units are there?

- a) 5
- b) 6
- c) 7
- d) 8

Q4) Giga has Power of

- a)  $10^{24}$
- b)  $10^{14}$
- c)  $10^9$
- d)  $10^{34}$

Q5) System and surrounding are separated by \_\_\_\_\_?

- a) Boundary
- b) Fence
- c) Power
- d) Border



**Section – B**

03X02 = 06 Marks

03 Short answer type questions, each question carries 02 marks.

Q. 1 Name and explain types of system?

Q. 2 Write the unit conversion for following Length?

- a) 25 cm into meter
- b) 200 mm into meter
- b) 2 inches into cm
- d) 10 cm into inch

Q. 3 Define heat and write the English and SI unit for the same?

**Section – C**

03X03 = 09 Marks

03 essay type questions, each question carries 03 marks.

Q. 1 Derive the Fundamental unit of the following physical Quantity?

- a) Displacement
- b) Force
- c) Velocity
- d) Acceleration

Q. 2 Convert the following temperature to the scale

- a) 15° celsius to F
- b) 32 F into °C
- c) 50 K into °Celsius
- d) 104 F into K

Q. 3 What is pressure? Write down different pressure units used in RAC.

**BHARTIYA SKILL DEVELOPMENT UNIVERSITY****School of RAC Skills****I Semester, 1<sup>st</sup> In-Sem. Examination****B. Voc. Program, Winter Semester (2020-21)****ANSWER KEY****Course Code: RAC1101****Time: 1 Hour****Course Name: Basics of RAC****Max. Marks: 20****Section – A**

05X01 = 05 Marks

1. B) General conference in weights and measures
2. A) Numerical value and unit
3. C) 7
4. C)  $10^9$
5. A) boundary

**Section – B**

03X02 = 06 Marks

Q. 1 Name and explain types of system?

**Answer:**

Open- There is interaction of energy and mass both.

Closed- There is interaction of energy but not the mass.

Isolated- There is neither interaction of energy nor mass of the surrounding.

Q. 2 Write the unit conversion for following Length?

- |                     |                      |
|---------------------|----------------------|
| a) 25 cm into meter | b) 200 mm into meter |
| b) 2 inches into cm | d) 10 cm into inch   |

**Answer:**

- |            |                 |
|------------|-----------------|
| c) 0.25 m  | b) 0.2 m        |
| d) 5.08 cm | d) 3.937 inches |

Q. 3 Define heat and write the English and SI unit for the same?

Answer: **Heat** is the form of energy that is transferred between systems or objects with different temperatures (flowing from the high-temperature system to the low-temperature system)

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Units are 1 Joule or 1 BTU.

### Section – C

03X03 = 09 Marks

Q. 1 Derive the Fundamental unit of the following physical Quantity?

- a) Displacement      b) Force  
c) Velocity              d) Acceleration

**Answer:**

- a) Displacement- = Length,  $[M^0L^1T^0]$ , m  
b) Force= mass \* acceleration,  $[M^1L^1T^{-2}]$ , N  
c) Velocity =  $[M^0L^1T^{-1}]$ , m/s  
d) Acceleration =  $[M^0L^1T^{-2}]$ ,  $m/s^2$

Q. 2 Convert the following temperature to the scale

- a)  $15^\circ$  celsius to F                      b) 32 F into  $^\circ$ C  
c) 50 K into  $^\circ$ Celsius                  d) 104 F into K

**Answer:**

- a) 59 F                                      b)  $0^\circ$ C  
c)  $-223^\circ$  Celsius                      d) 313 K

Q. 3 What is pressure? Write down different pressure units used in RAC.

Answer:

Pressure is the amount of force applied at right angles to the surface of an object per unit area. The symbol for it is p or P.

$$\text{Pressure} = \text{Force} / \text{Area}$$

The SI unit is 'pascals (Pa)'.  $1 \text{ Pa} = 1 \text{ N/m}^2$

Pascal, Bar, PSI are used in RAC





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## School of RAC Skills

I Semester, 1<sup>st</sup> In-Sem. Examination

B. Voc. Program, Winter Semester (2020-21)

Course Code: RAC1102

Time: 1 Hour

Course Name: Domestic RAC Appliances

Max. Marks: 20

**SET-B**

### Instruction:

1. Attempt all Questions.
2. Each question of Section – A carries 01 mark.
3. Each question of Section – B carries 02 mark.
4. Each question of Section – C carries 03 mark.

### Section – A

05X01 = 05 Marks

1. Which type of instrument a Micrometer is?

- a. Measuring
- b. Gauging
- c. Both
- d. None of the above

2. Which type of instrument a Capillary Gauge is?

- a. Measuring
- b. Gauging
- c. Both
- d. None of the above

3. Value of 100 micron in Millimeter (mm) is:

- a. 0.1 mm
- b. 0.01 mm
- c. 1 mm
- d. None of the above

4. By which component, pressure reduction is done in your room AC?

- a. Compressor
- b. Condenser
- c. Expansion device
- d. None of the above

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5. Heat rejection from refrigerant take place in:

- A. Compressor
- B. Condenser
- C. Both A & B
- D. None of the above

### Section – B

03X02 = 06 Marks

1. Write down the classification of inspection system with a neat sketch.
2. You have a micrometer of least count 0.02 mm. Minimum measurable value on main scale is 0.5 mm. Find out the total number of divisions on secondary scale.
3. What is an evaporation process and where does it take place in a RAC system?

### Section – C

03X03 = 09 Marks

1. How the compressor is an important component in an air conditioning cycle? Explain its working through a neat sketch.
2. Give the name of all the parts of a micrometer with the help of a neat sketch.
3. Explain the different types of condenser in detail.





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## School of RAC Skills

I Semester, 1<sup>st</sup> In-Sem. Examination

B. Voc. Program, Winter Semester (2020-21)

Course Code: RAC1102

Time: 1 Hour

Course Name: Domestic RAC Appliances

Max. Marks: 20

### ANSWER KEY

#### SET- B

#### Instruction:

1. Attempt all Questions.
2. Each question of Section – A carries 01 mark.
3. Each question of Section – B carries 02 mark.
4. Each question of Section – C carries 03 mark.

#### Section – A

05X01 = 05 Marks

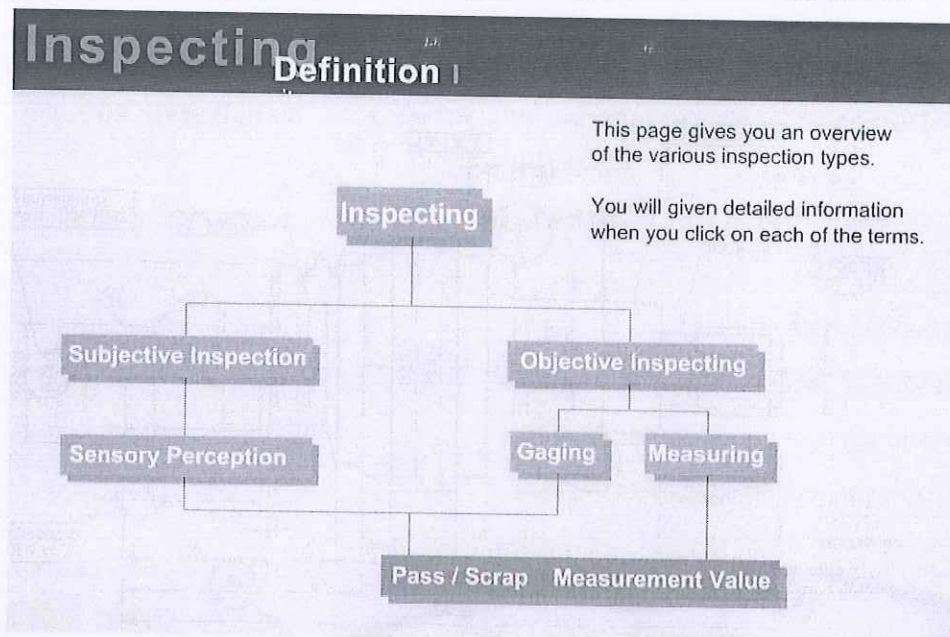
1. Which type of instrument a Micrometer is?
  - a. Measuring
2. Which type of instrument a Capillary Gauge is?
  - b. Gauging
3. Value of 100 micron in Millimeter (mm) is:
  - b. 0.01 mm
4. By which component, pressure reduction is done in your room AC?
  - c. Expansion device
5. Heat rejection from refrigerant take place in:
  - b. Condenser

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## Section – B

03X02 = 06 Marks

- Write down the classification of inspection system with a neat sketch.



- You have a micrometer of least count 0.02 mm. Minimum measurable value on main scale is 0.5 mm. Find out the total number of divisions on secondary scale.

**Solution:**  $0.02 = 0.5/x$

$$X = 100 \text{ Division}$$

- What is an evaporation process and where does it take place in a RAC system?

**Solution:** Evaporation is a type of vaporization that occurs on the surface of a liquid as it changes into the gas phase. The surrounding gas must not be saturated with the evaporating substance. It takes place inside the evaporator

## Section – C

03X03 = 09 Marks

- How the compressor is an important component in an air conditioning cycle? Explain its working through a neat sketch cycle.

**Solution:** Compressor pumps the refrigerant in complete cycle and generates pressure.

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2. Gi  
v  
e

the name of all the parts of a micrometer with the help of a neat sketch.

3. Explain the different types of condenser in detail.

Answer:

Classification of condensers:

Based on the external fluid, condensers can be classified as:

- a) Air cooled condensers
- b) Water cooled condensers, and
- c) Evaporative condensers

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### **Air-cooled condensers:**

As the name implies, in air-cooled condensers air is the external fluid, i.e., the refrigerant rejects heat to air flowing over the condenser. Air-cooled condensers can be further classified into natural convection type or forced convection type.

### **Water Cooled Condensers:**

In water cooled condensers water is the external fluid. Depending upon the construction, water cooled condensers can be further classified into:

1. Double pipe or tube-in-tube type
2. Shell-and-coil type
3. Shell-and-tube type

### **Evaporative condensers:**

In evaporative condensers, both air and water are used to extract heat from the condensing refrigerant. Evaporative condensers combine the features of a cooling tower and water-cooled condenser in a single unit. In these condensers, the water is sprayed from top part on a bank of tubes carrying the refrigerant and air is induced upwards.



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School of RAC Skills

I Semester, 1<sup>st</sup> In-Sem. Examination

B. Voc. Program, Winter Semester (2020-21)

Course Code: RAC1103

Time: 1 Hour

Course Name: RAC Electrical, Electronics &amp; Instrumentation-I

Max. Marks: 20

Instruction:

1. Attempt all Questions and write the detailed answer of MCQ's.
2. Each question of Section – A carries 01 mark.
3. Each question of Section – B carries 02 mark.
4. Each question of Section – C carries 03 mark.

## Section – A

05X01 = 05 Marks

1. Ampere is the S.I. unit of :
  - a. Current
  - b. Voltage
  - c. Resistance
  - d. Time
2. Resistance is the?
  - a. Oppose to electric current flow.
  - b. Oppose to the work done
  - c. Concentration of work
  - d. Energy
3. Watt is the S.I. unit of
  - a. Resistance
  - b. Voltage
  - c. Power
  - d. Current
4. Capacitor is also known as .
  - a. Transformer
  - b. Regulator
  - c. Condenser

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d. Electric Switch

5. Ohm's Law deals in which relation?

- a.  $V = I \times R$
- b.  $I = V \times R$
- c. All of the above
- d. None of the above

### Section – B

03X02 = 06 Marks

1. What is resistance. Explain by giving examples?
2. What is a capacitor.
3. What is an Inductor?

### Section – C

03X03 = 09 Marks

1. Describe Ohm's law in detail.
2. Explain A.C. and D.C. in detail.
3. How we find the value of a resistor.

*Daigh*



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School of RAC Skills

I Semester, 1<sup>st</sup> In-Sem. Examination

B. Voc. Program, Winter Semester (2020-21)

## ANSWER KEY

Course Code: RAC1103

Time: 1 Hour

Course Name: RAC Electrical, Electronics & Instrumentation -I Max. Marks: 20

### Section – A

05X01 = 05 Marks

1. Ampere is the S.I. unit of:
  - a. Current
2. Resistance is the ?
  - a. Oppose to the electric current flow.
3. Watt is the S.I. unit of
  - c. Power
4. Capacitor is also known as .
  - c. Condenser
5. Ohm's law is deal in which relation?
  - a.  $V = I \times R$

### Section – B

03X02 = 06 Marks

1. What is resistance. Explain by giving examples?

**ANSWER:** How much opposition the conductor or metal wire presents to the electric current flow is the electrical resistance. The lower the resistance, the easier current will flow. Think of current like water flowing through a pipe, if the pipe is small there is more resistance to water flow, if the pipe is large the water will flow much easier.

2. What is a capacitor.

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**ANSWER:** A capacitor (originally known as a condenser) is a passive two-terminal electrical component used to store energy electro statically in an electric field.

3. What is an Inductor

**ANSWER:** An Inductor (also known as a choke) is a passive two-terminal electrical component that store energy in a magnetic field when electric current flows through it.

### Section – C

03X03 = 09 Marks

1. Describe Ohm's law in detail

**Answer :** Ohm's law deals with the relationship between potential difference in the circuit and the current flowing in the circuit. This law was discovered by Georg Simon Ohm.

Ohm law states that:

Potential difference (Voltage) applied across conductor is directly proportional to the current flowing through it.

$$V \propto I$$

where,  $V$  = potential difference across conductor.

$I$  = current flowing through the conductor.

Here, the constant of proportionality is called RESISTANCE 'R'.

So,  $V = I \times R$ .

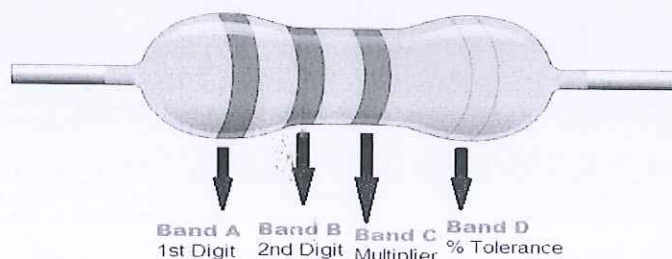
2. Explain A.C. and D.C. in detail.

**Answer:** The current which changes its directions periodically, such type of current is called alternating current.

When the electric charge inside the conductor flows in one direction, then such type of current is called direct current

3. How we find the value of a particular resistor.

**Answer:**



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School of RAC Skills  
I Semester, 2<sup>nd</sup> In-Sem. Examination  
B. Voc. Program, Winter Semester (2020-21)

Course Code: RAC1104

Course Name: Rac Materials and joining process

Instruction: Attempt all

Time: 1 Hour

Max. Marks: 20

**Section – A**

05X01 = 05 Marks

Q1. Which among is used for Permanent joining process?

- a)Cotter pin knuckle joint    b) Brazing and welding  
c)Bolts and nuts                d) Option A, C both

Q2. Area is \_\_\_\_\_

- a)2-Dimensional                b) 3-Dimensional  
c)Space                         d) None of the above option

Q3. How elements are classified \_\_\_\_\_?

- a) Metals & Metalloids        b) Metals and Non Metals  
c)Elements and compounds    d) Isotopes

Q4. \_\_\_\_\_ is the most malleable metal ?

- a)Silver                         b)Gold  
c)Iron                            d)brass

Q5. What is ductility of metal \_\_\_\_\_

- a) To draw into wires        b)To be shiny when cutted into pieces  
c) Can be drawn into sheets    d)Ability to be liquid at room temperature

**Section – B**

03X02 = 06 Marks

Q6. Draw the flow chart for classification of Engineering materials?

Q7. What are the physical Properties of Metal ?

Q8. Difference between Temporary and permanent joints?

**Section – C**

03X03 = 09 Marks

Q9. Draw the neat sketch of brazing setup and label each of the component.?

Q10. Difference between Brazing and welding ?

Q11. What is sonority or sonorous ?

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**School of RAC Skills**  
**I Semester, 2<sup>nd</sup> In-Sem. Examination**  
**B. Voc. Program, Winter Semester (2020-21)**

**Course Code: RAC1104**

**Time: 1 Hour**

**Course Name: Rac Materials and joining process**

**Max. Marks: 20**

**Instruction: Attempt all**

**Section – A**

05X01 = 05 Marks

A1. b) Brazing and welding

A2.a) 2-Dimensional

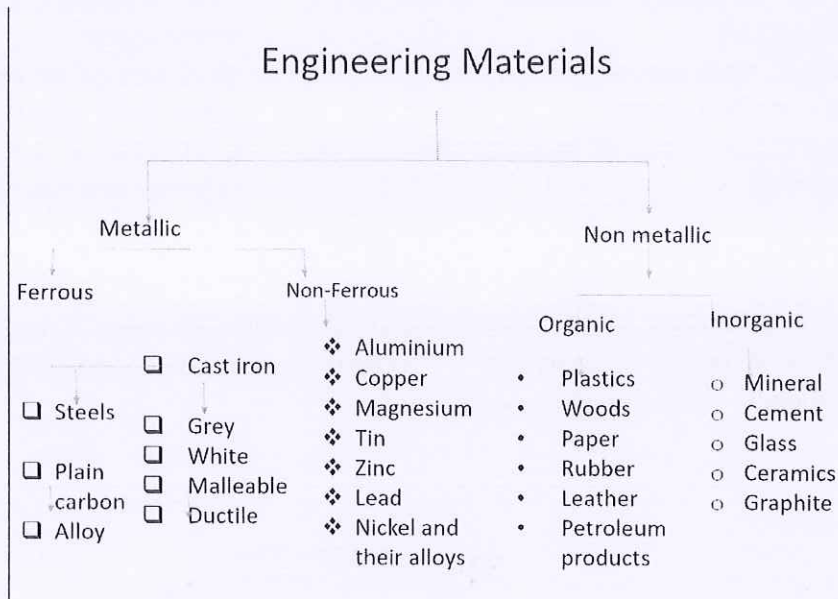
A3. b) Metals and Non-Metals

A4. b) Gold

A5.a) To draw into wires

A6.

Answer Key



A7.

1. Lustre 2. Sonority 3. Hardness 4. Ductile 5. Thermal conductivity 6. Electrical conductivity

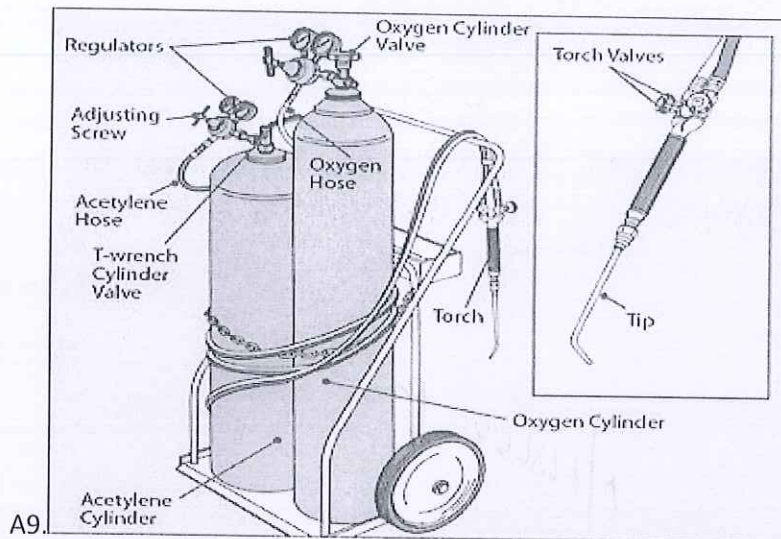
7. Malleable 8. State of existence 9. Melting point 10. Boiling point 11. Allotropy

A8.

Temporary Joining	Permanent Joining
A temporary joint can be dismantled without breaking the assembled parts	A permanent joint cannot be dismantled without breaking parts
Temporary joining is beneficial where frequent assembly and disassembly are required	Permanent joining is beneficial where joint is intended to stay fixed for longer period
Strength of temporary joint is comparatively lower	Permanent joint offers stronger joining.
Temporary joints are not leak-proof	Most permanent joining processes provide leak-proof joints.

Section – C

03X03 = 09 Marks



A10.

S.No	Welding	Brazing
1	Welding joints are strongest joints used to bear the load. Strength of the welded portion of joint is usually more than the strength of base metal.	Brazing joints are weaker than welding joints. This can be used to bear the load up to some extent.
2	To join, work pieces need to be heated till their melting point.	Work pieces are heated but below their melting point.
3	Heat cost is involved and high skill level is required.	Cost involved and skill required is lower than welding.

A11. Ability of metal to produce sound on being hammered is called Sonorous. Sonorous metals mean a deep, full, pleasing, and imposing sound. It is one of the physical properties of a metal through which a sound is produced when metal is hit.

Harshika Sharma



School of RAC Skills  
Session: 2020-21 (Winter Semester)  
B. Voc. Program, 1st Semester,  
1<sup>st</sup> In-Sem. Examination

Course Code: RAC1105

Time: 1 Hour

Course Name: RAC Systems Component Testing and performance

Max. Marks: 20

Instruction: In section A, write both option and answer

Section – A

05X01 = 05 Marks

1. What is the latent heat of water?
  - a. 4.2 KJ/Kg
  - b. 4.2 KJ/Kg C
  - c. 334 KJ/Kg
  - d. 334 KJ/Kg C
2. Which equation represent pressure correctly?
  - a.  $P = \text{Area} / \text{Force}$  in Celsius
  - b.  $P = \text{Force} / \text{Area}$  in Celsius
  - c.  $P = \text{Area} / \text{Force}$  in PSIG
  - d.  $P = \text{Area} / \text{Force}$  in Newton
3. What is equal to 1 TR?
  - a. 746 W
  - b. 1200 BTU
  - c. 2 HP
  - d. 2 HP
4. What is unit of COP?
  - a. Btu
  - b. 1 HP
  - c. HP
  - d. None of the above.
5. What is equal to 0C (temperature)?
  - a. 32 F
  - b. 0 F
  - c. 0 K
  - d. 273 F

Section – B

03X02 = 06 Marks

6. What are the different phases of matter?
7. What is pressure, what are different units to measure it?
8. What is the definition of heat?

Section – C

03X03 = 09 Marks

9. Write short note on following topics: -
  - i. Power
  - ii. Energy
10. Write a short note on vapour compression refrigeration cycle.
11. Write a short note on Carnot COP.





School of RAC Skills  
Session: 2020-21 (Winter Semester)  
B. Voc. Program, 1st Semester,  
1<sup>st</sup> In-Sem. Examination

Course Code: RAC1105

Time: 1 Hour

Course Name: RAC Systems Component Testing and performance

Max. Marks: 20

Instruction: In section A, write both option and answer

**Answer Key**  
**Section – A**

05X01 = 05 Marks

1. What is the latent heat of water?  
a. 4.2 KJ/Kg
2. Which equation represent pressure correctly?  
c.  $P = \text{Area} / \text{Force}$  in PSIG
3. What is equal to 1 TR?  
d. None of the above
4. What is unit of COP?  
d. None of the above.
5. What is equal to 0C (temperature)?  
a. 32 F

**Section – B**

03X02 = 06 Marks

6. What are the different phases of matter?

The three common phases (or states) of matter are gases, liquids, and solids. Gases have the lowest density of the three, are highly compressible, and completely fill any container in which they are placed. Gases behave this way because their intermolecular forces are relatively weak, so their molecules are constantly moving independently of the other molecules present. Solids, in contrast, are relatively dense, rigid, and incompressible because their intermolecular forces are so strong that the molecules are essentially locked in place. Liquids are relatively dense and incompressible, like solids, but they flow readily to adapt to the shape of their containers, like gases. We can therefore conclude that the sum of the intermolecular forces in liquids are between those of gases and solids.

7. What is pressure, what are different units to measure it?

Pressure, in the physical sciences, the perpendicular force per unit area, or the stress at a point within a confined fluid. The pressure exerted on a floor by a 42-pound box the



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bottom of which has an area of 84 square inches is equal to the force divided by the area over which it is exerted; i.e., it is one-half pound per square inch. The weight of the atmosphere pushing down on each unit area of Earth's surface constitutes atmospheric pressure, which at sea level is about 15 pounds per square inch. In SI units, pressure is measured in pascals; one pascal equals one newton per square metre

8. What is the definition of heat?

Heat, energy that is transferred from one body to another as the result of a difference in temperature. If two bodies at different temperatures are brought together, energy is transferred—i.e., heat flows—from the hotter body to the colder. The effect of this transfer of energy usually, but not always, is an increase in the temperature of the colder body and a decrease in the temperature of the hotter body. A substance may absorb heat without an increase in temperature by changing from one physical state (or phase) to another, as from a solid to a liquid (melting), from a solid to a vapour (sublimation), from a liquid to a vapour (boiling), or from one solid form to another (usually called a crystalline transition).

## Section – C

03X03 = 09 Marks

9. Write short note on following topics: -

- i. Power: energy, expressible as the amount of work done  $W$ , or energy transferred, divided by the time interval  $t$ —or  $W/t$ . A given amount of work can be done by a low-powered motor in a long time or by a high-powered motor in a short time. Units of power are those of work (or energy) per unit time, such as foot-pounds per minute, joules per second (or watts), and ergs per second.
- ii. Energy: -Energy, in physics, the capacity for doing work. It may exist in potential, kinetic, thermal, electrical, chemical, nuclear, or other various forms. There are, moreover, heat and work—i.e., energy in the process of transfer from one body to another. After it has been transferred, energy is always designated according to its nature. Hence, heat transferred may become thermal energy, while work done may manifest itself in the form of mechanical energy.

10. Write a short note on vapour compression refrigeration cycle.

Step 1: Compression

The refrigerant (for example R-717) enters the compressor at low temperature and low pressure. It is in a gaseous state. Here, compression takes place to raise the temperature and refrigerant pressure. The refrigerant leaves the compressor and enters to the condenser. Since this process requires work, an electric motor may be

used. Compressors themselves can be scroll, screw, centrifugal or reciprocating types.

## Step 2: Condensation

The condenser is essentially a heat exchanger. Heat is transferred from the refrigerant to a flow of water. This water goes to a cooling tower for cooling in the case of water-cooled condensation. Note that seawater and air-cooling methods may also play this role. As the refrigerant flows through the condenser, it is in a constant pressure. One cannot afford to ignore condenser safety and performance. Specifically, pressure control is paramount for safety and efficiency reasons. There are several pressure-controlling devices to take care of this requirement

## Step 3: Throttling and Expansion

When the refrigerant enters the throttling valve, it expands and releases pressure.

Consequently, the temperature drops at this stage. Because of these changes, the refrigerant leaves the throttle valve as a liquid vapor mixture, typically in proportions of around 75 % and 25 % respectively. Throttling valves play two crucial roles in the vapor compression cycle. First, they maintain a pressure differential between low- and high-pressure sides. Second, they control the amount of liquid refrigerant entering the evaporator.

## Step 4: Evaporation

At this stage of the Vapor Compression Refrigeration Cycle, the refrigerant is at a lower temperature than its surroundings. Therefore, it evaporates and absorbs latent heat of vaporization. Heat extraction from the refrigerant happens at low pressure and temperature. Compressor suction effect helps maintain the low pressure. There are different evaporator versions in the market, but the major classifications are liquid cooling and air cooling, depending whether they cool liquid or air respectively.

11. Write a short note on Carnot COP.

The coefficient of performance (COP) of Carnot refrigerator is :

$$\text{COP of Carnot} = \frac{\text{Temperature of Sink}}{(\text{Temperature of source} - \text{Temperature of Sink})}$$

Where, Temperature of Sink = The body temperature which is being cooled

Temperature of Source = The atmosphere where the heat is being rejected.

Note: For a same temperature range and working conditions, Carnot refrigerator gives highest COP and thus, it is used as benchmark to compare the COP of actual refrigerator.



