Tertiary and Vocational Education Commission
Knowledge Assessment – July 2022
Refrigeration and Air Conditioning Mechanic
National Vocational Qualification Level 04

Time: 1 ½ Hours

Instructions for the Candidates

- Answer all questions
- In each of the questions from 1 to 50, pick the one of the alternatives (a), (b), (c), (d) which you consider is correct or most appropriate.
- Mark a cross (x) on the number corresponding to your choice in the answer sheet provided.
- This question paper consists of 09 pages

Part 1

1. Which of the following unit is relevant to the International System of Measurements (SI);
    a) ft
    b) m
    c) Ryan
    d) Bo

2. The PSI that is used to measure pressure is:
    a) Pounds per square centimeter.
    b) Pounds per square inch.
    c) Pounds per cubic centimeter.
    d) Pounds per cubic inch.

3. Reason for applying "U" shaped end to a drain pipe of the evaporator in cold storage rooms,
    a) To allow the water to drain gradually
    b) To prevent the formation of mosquitoes
    c) To prevent contaminated air entering to the system through the pipe
    d) To prevent noise coming out

4. An "L" shaped iron support is used for the outdoor part of a Split type room air conditioner to attach to the wall. It was observed that “Anchor Bolt” is not enough to sustain the L shaped iron support. The correct way of attaching it is,
    a) Tighten the anchor bolt with the correct force
    b) Hanging using a thread bar
    c) Apply a large anchor bolt
    d) Mounting the thread bar across the wall

5. Corporate profit should be calculated when preparing estimates for air conditioning repairs,
    a) At the expense of the raw material
    b) To the sum of the total expenses
    c) At the expense of machinery
    d) Government tax expenditure

6. A company gets 20% of the corporate profit for a complete estimate of Rs. 25,000 for a refrigerator repair. Accordingly, the corporate profit is,
    a) Rs. 250.00
    b) Rs. 500.00
    c) Rs. 2500.00
    d) Rs. 5000.00

7. Which of the following refrigerant is currently used as a Fluxing Liquid in the refrigeration system,
    a) R-141b
    b) R-11
    c) R-1234y
    d) R-32

8. One of the reasons for the wide spread use of copper pipes in the field of refrigeration and air conditioning is,
    a) Being a good thermal conductor
    b) Inability to adapt easily
    c) Relatively inexpensive
    d) Being a good thermal insulator

9. Lock Rotor Ampere (LRA) on the label of a compressor;
    a) is the running current
    b) is the compression current
    c) is the starting current
    d) is the rated current

10. The highest temperature at the operating vapor compression refrigeration system is;
    a) At the end of the condenser
    b) In the compressor discharge tube
    c) In the compressor suction tube
    d) In the dry filter

11. What are two devices that are located in the low pressure zone of the refrigeration cycle;
    a) Suction accumulator and evaporator
    b) Suction accumulator and filter
    c) Evaporator and oil separation
    d) Oil separator and condenser

12. The figure shows a signal board used in a factory. It means;
    a) Flammable
    b) A place containing explosives
    c) Spray with water
    d) Toxic substance

13. What will happen when the cooling fins of condensers in split type air conditioners is accumulated with dust when exposed to air;
    a) Excessive suction pressure will occur
    b) Excessive discharge pressure will occur
    c) The suction pipe will become too cool
    d) The condenser will become cool

14. What can be happened and observed when the air filter in a room air conditioner is completely blocked due to dust accumulation; Choose the correct answer
    a) The evaporator binds completely with the ice
    b) The condenser becomes cold.
    c) The discharge path up to the compressor may be bound with ice
    d) The cooling of the machine will not change

15. When air conditioning a space, the humidity of that space must be controlled. The most suitable relative humidity required to be maintained when air conditioning a space for human comfort;
    a) 05% - 06%
    b) 25% - 30%
    c) 30% - 40%
    d) 50% - 60%

16. The most accurate statement regarding a refrigerant that is used in the field of refrigeration and air conditioning should;
    a) Have high boiling point
    b) Have low boiling point
    c) React with the lubricating oil in the compressor.
    d) Not mix with lubricating oil.

17. What is best to find a leak after repairing of a refrigeration system
    a) Dry nitrogen gas
    b) Oxygen gas
    c) Normal air
    d) Refrigerant gas

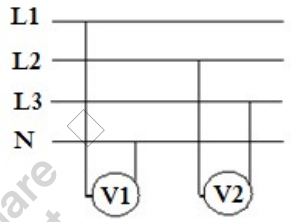
18. The purpose of insulating the pipes connecting the inside part (Indoor unit) and the outside part (Outdoor unit) of a split type air conditioner;
    a) To prevent absorption of unwanted heats.
    b) For the strength of the pipes
    c) For the safety of the pipes
    d) To prevent corrosion of pipes.

19. The speed control of the compressor of an inverter type air conditioner is controlled,
    a) By changing the current.
    b) By changing the pressure.
    c) By changing the voltage.
    d) By changing the frequency.

20. Which of the following device is used to protect the compressor in the event of breaking down of a phase of a three phase air conditioner?
    a) High pressure cut out
    b) Phase failure Relay
    c) Over load
    d) Time delay device

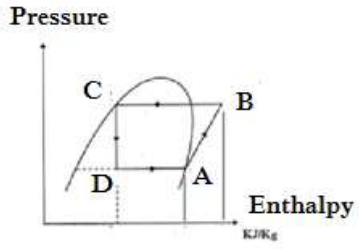
21. Which of the following statement states that "the current flowing through a conductor is proportional to the potential difference between the two ends, even when other physical factors including temperature are constant";
    a) Ohm's law
    b) Boyle's law
    c) Charle's law.
    d) Gelusack's law.

22. The readings on the V1 and V2 voltmeters of a given transmission lines are respectively.
    a) 230V, 415V
    b) 415V, 230V
    c) 110V, 230V
    d) 230V, 460V



23. The sign board that is shown by the figure can be seen in factories and buildings. Which if the following is represented by the given board;
    a) Exit point in case of an emergency fire.
    b) The direction of the stairs
    c) Location of fire extinguishers.
    d) The places to go down.

24. The given figure shows the pressure-enthalpy graph of a refrigerator system at saturation phase. Here the activity of the condenser is shown by,
    a) AB
    b) BC
    c) CD
    d) DA



25. The type of chilled water pump that can be used to central air conditioning system which has a three-way motorized valve.
    a) Variable speed drive (VSD pump)
    b) Constant speed pump
    c) Single stage pump
    d) Multi stage pump

26. The air velocity in central air conditioning system is 600 m^2/min. What is the value when it is converted to m^2/s? ;
    a) 60 m^2/s
    b) 0.6 m^2/s
    c) 10 m^2/s
    d) 100 m^2/s

27. Which of the following should be done before measuring the resistance with an analog ohm meter;
    a) The resistance should be kept straight
    b) The analog ohm meter should be adjusted to zero
    c) The potential must be adjusted to zero.
    d) The analog ohm meter should be adjusted to infinity

28. In the HFC category, which of the following is a single refrigerant without a mixture;
    a) R-32
    b) R11
    c) R-134a
    d) R-410a

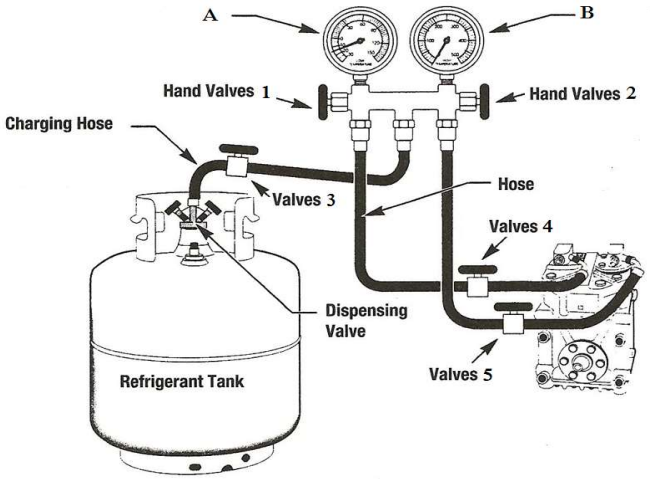
29. An important feature of synthetic oils that are used today is;
    a) Extremely hydrophilic
    b) The viscosity does not change with temperature
    c) Carbon deposition is high
    d) Oxidation is very high

30. The main advantage of refrigerant recycling is;
    a) Environmental protection and economic benefits
    b) Get good cooling from the machine
    c) Protect the compressor
    d) Comply with international conventions

31. The best way to fill a refrigerant into a central air conditioning system;
    a) According to the suction pressure
    b) According to the running current
    c) By experience
    d) According to the refrigerant weight

32. According to the given diagram, the valve that is needed to be opened to check the refrigerant pressure on the low pressure side is,

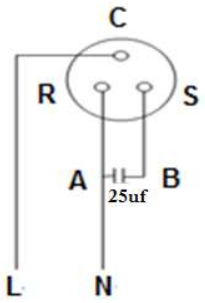
    a) Valve 1
    b) Valve 2
    c) Valve 3
    d) Valve 4



33. The diagram shows how a supply is given to a compressor of a room air conditioner connected with a 25µf running capacitor.

    When the capacity of the capacitor used to start this compressor is insufficient, an additional capacitor should be used.

    a) Between C and S, in parallel
    b) Between B and S, in series.
    c) Between A and B, parallel to the 25µf running capacitor.
    d) Between A and B, series for the 25µf running capacitor.



34. Which of the following temperature value is changed as the set point value in a central air conditioner?

    a) Chilled water in temperature value
    b) Chilled water out temperature value
    c) Condenser water in temperature value
    d) Condenser water out temperature value

35. The given diagram is a nameplate of an electric motor. According to the data available on it, what is the number of magnetic poles?

    a) 02 poles
    b) 04 poles
    c) 06 poles
    d) 08 poles

36. The refrigerant that is used since 1996 in place of the refrigerant R 12;

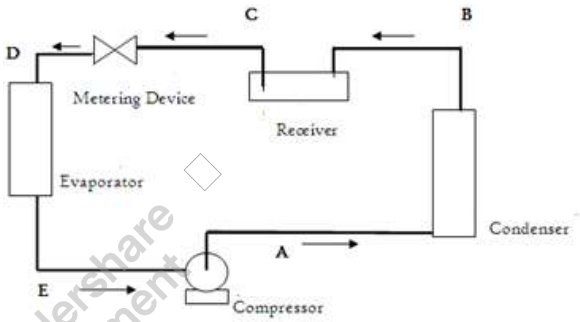
    a) R 22
    b) R 134a
    c) R 11
    d) R 113

37. The boiling point of the R 22 refrigerant at the standard atmospheric pressure is;

    a) -26 °C
    b) -29.6 °C
    c) -40.8 °C
    d) -48 °C

38. According to the following diagram, super heat can occur;

    a) In sections A and E
    b) In sections B and C
    c) In sections C and D
    d) In sections D and E



39. When three resistors 5Ω, 10Ω and 20Ω are connected in series, the equivalent resistance is;

    a) 2.8 ohms
    b) 05 ohms
    c) 10 ohms
    d) 35 ohms

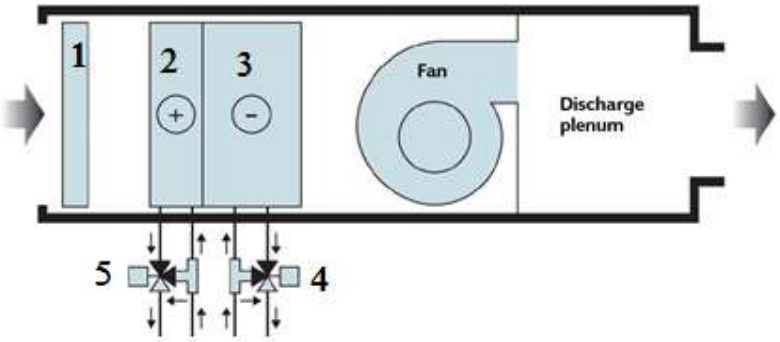
40. A suction accumulator is applied to a refrigeration system;

    a) To prevent refrigerant oil flow from the compressor
    b) To prevent refrigerant liquid entering into the compressor
    c) To separate the refrigerant oil
    d) To filter the waste etc.

41. What is the water capacity of a cylindrical chill water header of 10m length and 1.4m diameter?

    a) 15,400 liters
    b) 44,000 liters
    c) 61,600 liters
    d) 88,000 liters

42. The cross section of a Air Handling Unit (AHU) is given below. Here, number 4 is the;



a) Chilled water 3 way Motorized valve
b) Hot water 3 way Motorized valve
c) Chilled water Hand operated valve
d) Hot water Hand operated valve

43. The chemical name of the refrigerant R-600 a is;

a) ISOPROPHANE
b) ISOBUTANE
c) ISOBENZENE
d) BUTANE

44. One of the properties of a good refrigerant is;

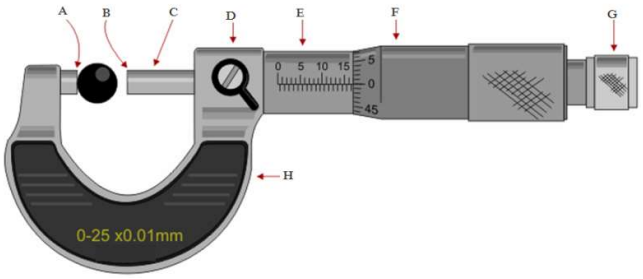
a) Must be explosive
b) Must have a smell or odor
c) Must be toxic
d) Must be non-flammable

45. When two capacitors of 25µF and 180 µF are connected in parallel what will be the equivalent capacitance

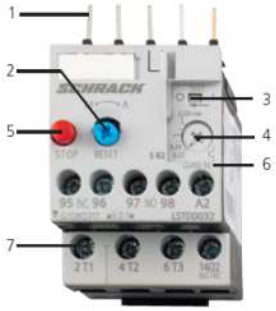
a) 205 µF
b) 22 µF
c) 102µF
d) 155 µF

46. The accuracy of the following micrometer is as follows:

a) 1/10 mm
b) 1/100 mm
c) 1/1000mm
d) 1/10000mm



47. The correct name of the given device is,



a) Thermal overload switch
b) Contactor switch
c) Relay switch
d) Transformer

48. A cooling tower is used;
a) To cool the hot refrigerant
b) For cooling water in chilled water system
c) To cool the water heated due to the absorption of heat by the condenser
d) To cool the liquid refrigerant

49. When a refrigerant system is operating, it exhibits high suction pressure and low discharge pressure. The reason may be;
a) Inadequate refrigerant
b) Blockage in the filter dryer
c) Presence of normal air in the system
d) Failure of the valve in the compressor

50. When the sensor bulb in the thermostat control of a refrigerator breaks;
a) The compressor does not work at all
b) The compressor continues to operate
c) The compressor is On-Off before reaching the set temperature
d) The compressor cools more than the set temperature and turns On-Off

(01 x 50 = 50 marks)

Tertiary and Vocational Education Commission
Knowledge Assessment – July 2022
Refrigeration and Air Conditioning Mechanic
National Vocational Qualification Level 04

Time: 1 1/2 Hours

Instructions for the Candidates

- Answer five (05) questions including question number one (01). Question number one (01) is compulsory and total number of Questions should be answered is five (05).
- Answer the questions in the spaces provided in the same question paper
- This question paper consists of 08 pages.

Part 2

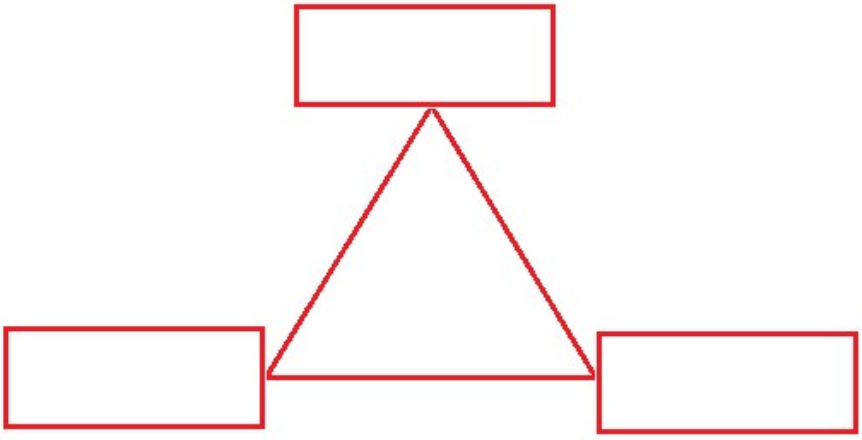
1.

i). It took three hours for two technicians to disassemble and carry out a full service for a BTU 18000 split type air conditioner which is installed in a room. This service place is located at a distance of 10 km from the Technicians' company. The transport charges for this servicing are Rs.75.00 per km. Rs. 2500.00 was spent on raw materials, tools and additional expenses. Technicians are paid Rs. 350.00 as salary per hour from the company. The company also makes a profit of 20% on each service and 12% VAT is paid to the government and it is charged from the customer. Prepare a complete estimate using the given table considering only the following points for the preparation of estimate.

(07 marks)

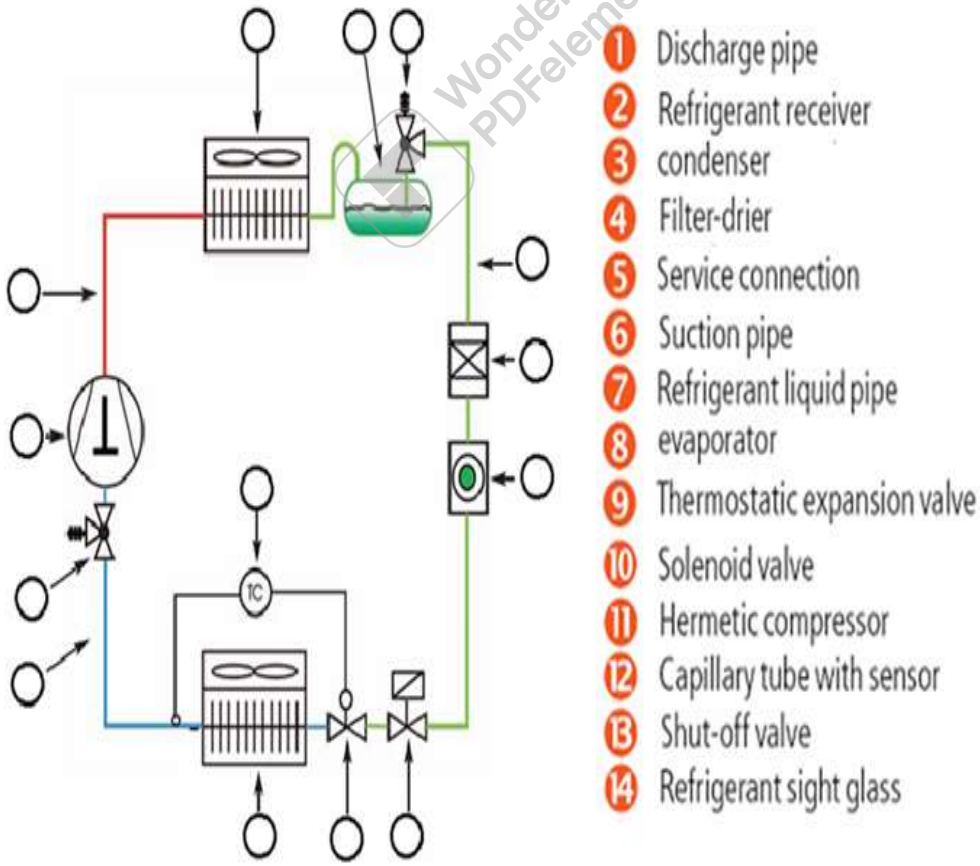
	Description	Quantity	Unit Price Rs.	Price Rs.
01	Materials			
02	Labour charge			
03	Transport			
04	**Sub Total 1**			
05	Company Profit 20%			
06	**Sub Total 11**			
07	Tax			
08	**Total Estimate**			

ii). Here are three main things that are needed in order to set a fire. Write down those three things in the fire triangle given below. (03 marks)



2.

i). The diagram of a refrigeration cycle is given below. The names of the parts of that diagram are given in the side. Using the correct numbers, mark the parts from 1 to 14 appropriately in the diagram. (07 marks)



ii). What is the device used to pump down the above system automatically? (03 marks)

3.

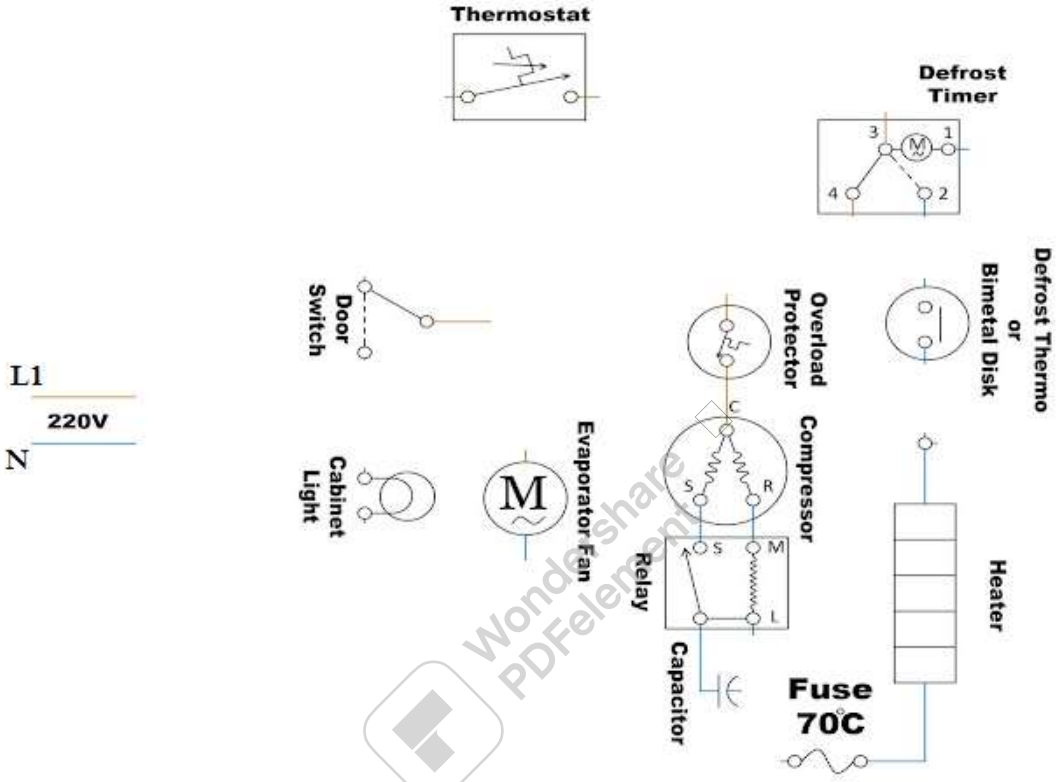
i). List down five (5) types of compressors according to the internal function of the compressor. (05 marks)

ii). A water cooler reduced the temperature of 300 kg water from 86^0F to 0^0C (zero) and turned it to cold water. What is the amount of heat that has been removed from the water? (Specific heat capacity of water 4.2 kJ / kgK)

(05 marks)

4.

i). The given diagram shows the devices of no frost type two door refrigerator circuit. Connect the devices to each other by means of conductors and complete the circuit in the same diagram. (08 marks)



ii). Indoor parts of split type air conditioners are given below. Write down the correct names in the blanks. (02 marks)

.....

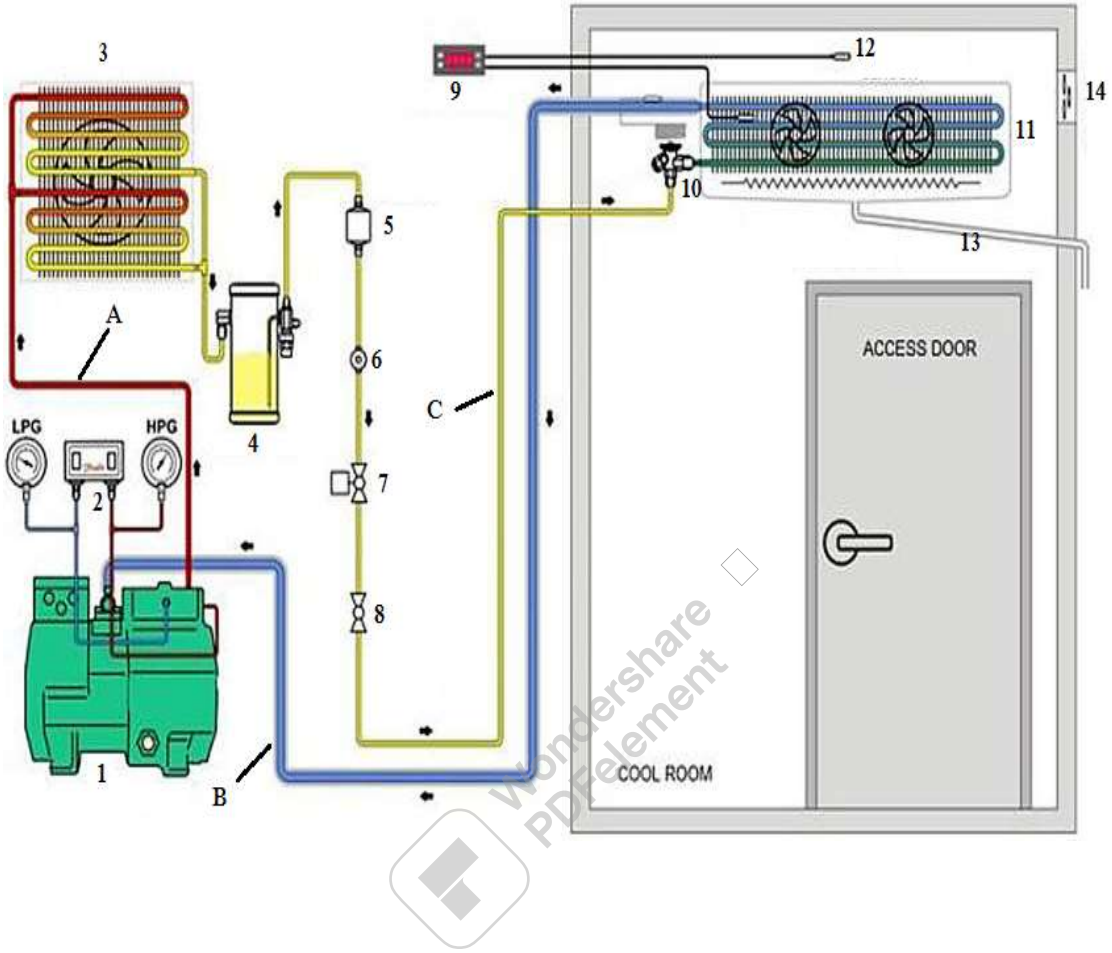
.....

.....

.....

5. A diagram of a Cold room is given below,

i). Write down the names of the sections 1 to 14 here. (07 marks)



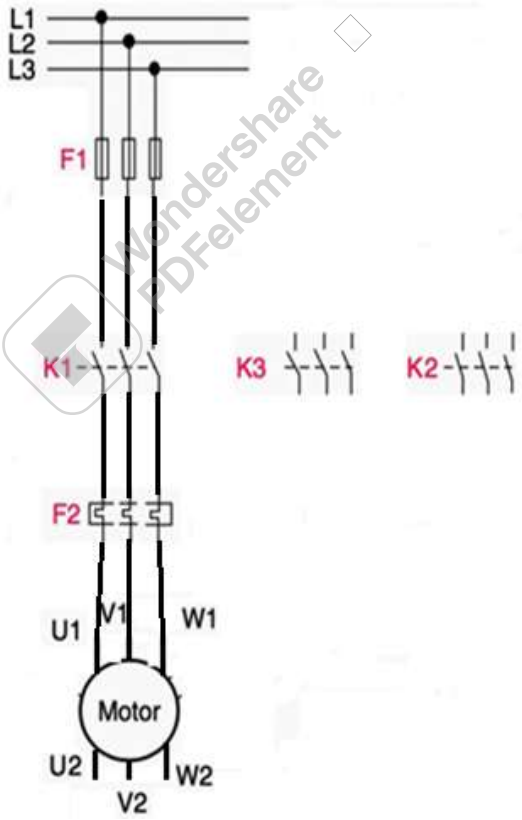
1		8	
2		9	
3		10	
4		11	
5		12	
6		13	
7		14	

ii). Briefly describe the conditions (pressure, temperature, liquid, gas) of the refrigerant at locations A, B, and C in the above figure. (03 marks)

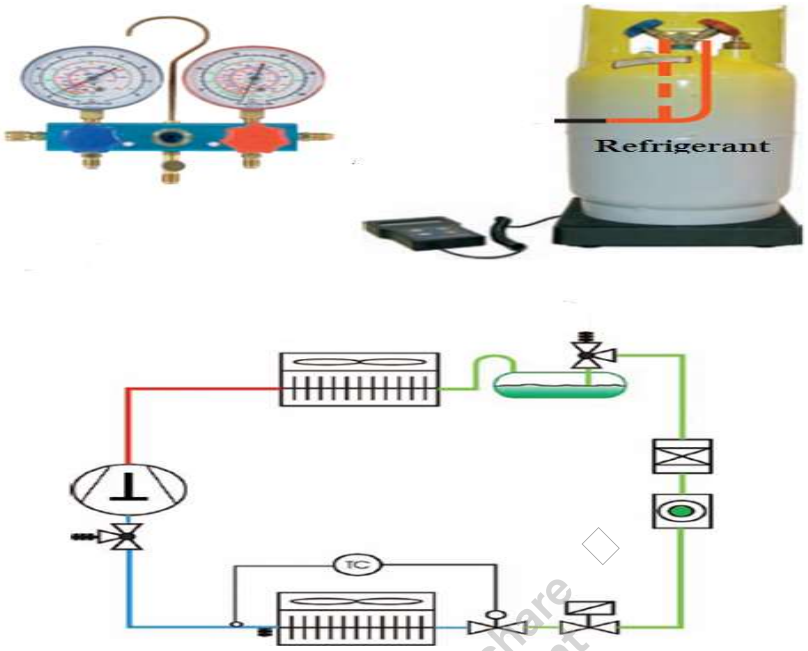
Place	Condition
A	
B	
C	

6.

i). A diagram of a Star Delta Motor Control circuit is given below. In the same diagram, draw the three phase power circuit which is required to operate the motor correctly using the K2 and K3 contactors as shown in the figure. (07 marks)

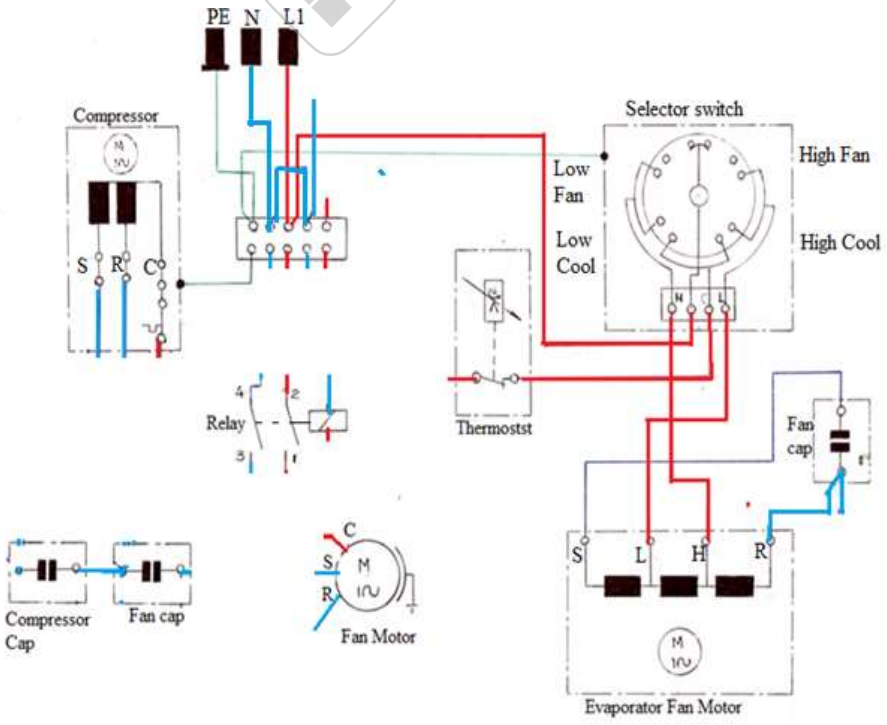


ii). In the given diagram, you are required to illustrate, how to connect the pipes to fill the refrigerant to the refrigeration system. (All pipes must be connected).
(03 marks)



7.

i). The following is an incomplete electrical circuit of a split type air conditioner. Complete it. (07 marks)



ii). Complete the table given below regarding the three types of refrigerant that are used for air conditioning and refrigeration. (03 marks)

	Refrigerant	**Formula**	**Boiling point**
1.	R - 134a		
2.	R - 22		
3.	R- 32		