

Operation

This exam guide contains model questions similar to the ones you would answer in the written examination. Our aim is to equip you on important subject areas. Answers provided are in the form of cues and bulleted list to enable easy recollection.

Questions

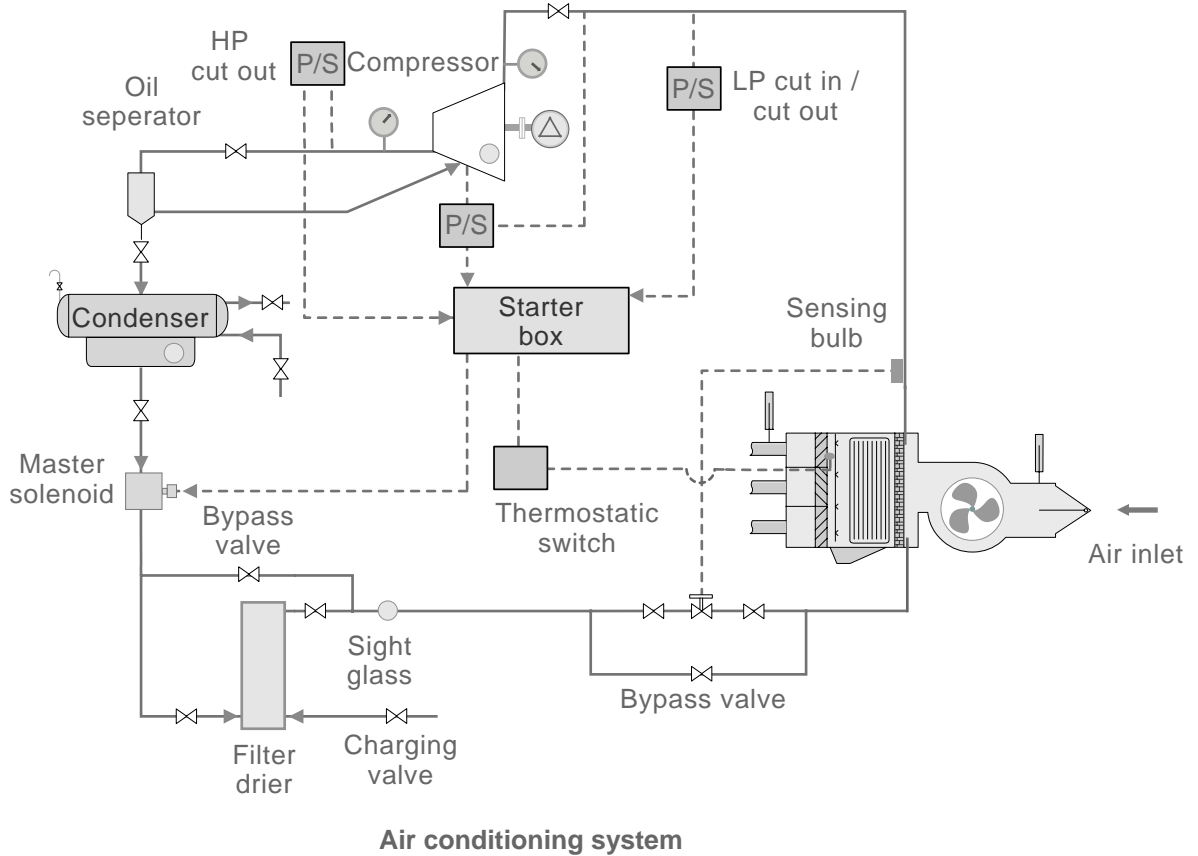
- 1 a. Sketch an air conditioning system including means of humidifying, dehumidifying and refrigerated cooling.
 - b. Give the conditions that can lead to legionella bacterial growth in air conditioning systems. Suggest remedies.
2. Sketch and describe a wet and dry bulb hygrometer and state how it can be used to obtain a measure of relative humidity of air.
3. With regard to air conditioning onboard:
 - a. State how it assists in maintaining health and efficiency of the crew.
 - b. Sketch and explain psychrometric chart.
 - c. State what would be regarded as a reasonably effective inside temperature and relative humidity in accommodation space.
 - d. State the causes and remedies for drying of the air causing discomfort and an unusually large amount of condensation forming on the inside of the bulkheads.

Operation

Q 1. a.

Sketch an air conditioning system including means of humidifying, dehumidifying and refrigerated cooling.

A



Operation

Q 1. b.

Give the conditions that can lead to legionella bacterial growth in air conditioning systems. Suggest remedies.

A Air conditioning systems contaminated by Legionella bacteria

Legionnaires disease is caused by bacteria which thrives in stagnant water or sludge. It can also be found in wet matrix filters installed in the filtration system for the air conditioning plant.

Main danger areas

Air inlet arrangements- This may be direct or indirect from the air conditioning room via jalousies, which, when incorrectly designed may direct rain water onto the filters. It may also be allowed to accumulate in the space where drainage is not efficient.

Filters- These filters made of 25mm thick synthetic material can trap water as well as insects and soot. Thereby, and leads to a rapid growth of bacteria.

Dehumidifier- Ineffective drainage can allow water to stagnate in the catchment sumps. Also, where air velocities are high over the block, air can be entrained and carry moisture into the air stream. An efficient moisture eliminator is required.

Humidifier- The enclosed tank and matrix elements of the water spray type of adiabatic humidifier breeds bacteria. This gets carried into the air stream when sprayed.

Plenum Insulation- Considerable levels of water may be present in the PVC GRP cover of the rock wool insulation.

Remedies

Filters- The filters should be washed in 50 ppm hypochlorite solution on a regular basis.

Coolers- Inspection of drainage arrangements, and super chlorinating the condensate sump every 3 months.

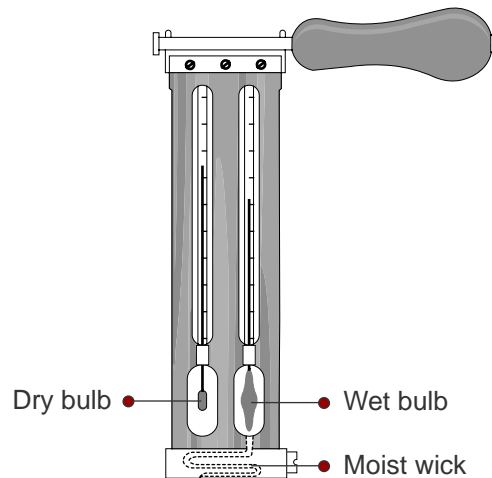
Plenum insulation- The insulation has to be examined and refitted. The damaged areas should be sealed.

Operation

Q 2.

Sketch and describe a wet and dry bulb hygrometer and state how it can be used to obtain a measure of relative humidity of air.

A Description



Wet and dry bulb hygrometer

- The relative humidity in an air conditioned space can be measured accurately using wet and dry bulb hygrometer.
- This instrument is also called sling psychrometer.
- When sling psychrometer is whirled around, the air movement causes evaporation of water from moist wick. This temperature is compared with the dry bulb temperature.
- In saturated air, both the readings remains the same.
- The drier the air the greater will be the decrease in wet bulb temperature.
- The difference in wet bulb and dry bulb temperatures will give an insight into the relative humidity of the space.
- To obtain the relative humidity from a pair of WBT and DBT, the point of intersection of lines of constant WBT DBT are marked on the chart.
- The line of relative humidity passing through this point is the required relative humidity.

Operation

Q 3. a.

With regard to air conditioning onboard: State how it assists in maintaining health and efficiency of the crew.

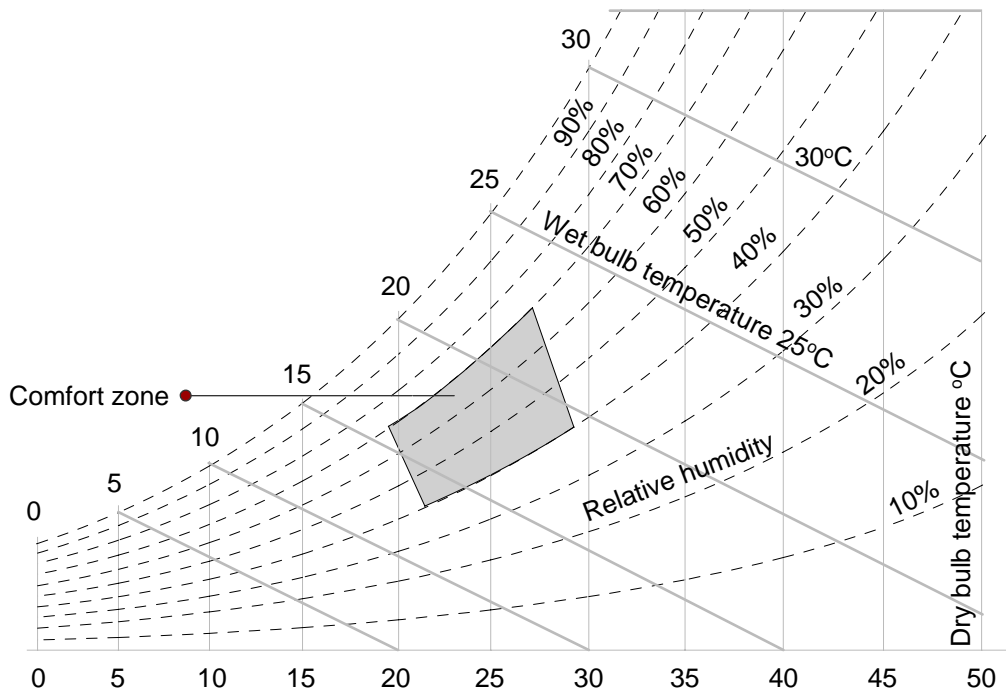
A

After a hard days work, the crew returns to the accommodation area. An efficient air conditioning system will enable the crew to take adequate rest and return to work the next day with new zeal and enthusiasm.

Q 3. b.

With regard to air conditioning onboard, state how it assists in maintaining health and efficiency of the crew.

A



Operation

Explanation

The psychrometric chart is used to define air conditions, and is used to convert the readings of wet bulb and dry bulb temperatures (WBT and DBT) into corresponding relative humidity.

A psychrometric chart is shown above. The vertical lines represent dry bulb temperatures (DBT) and dotted lines represent relative humidity.

To obtain the relative humidity from a pair of WBT and DBT, the point of intersection of lines of constant WBT DBT are marked on the chart.

The line of relative humidity passing through this point is the required relative humidity.

The area indicated is called comfort zone. The extent of comfort zone emphasizes the importance of relative humidity.

For example 29°C with RH of 40% result not warm.

22°C will feel too cold unless RH is above 40%.

Q 3. c.

With regard to air conditioning onboard, state what would be regarded as a reasonably effective inside temperature and relative humidity in accommodation space.

A 20°C to 24°C with 40% to 70% of RH.

Q 3. d.

State the causes and remedies for drying of the air causing discomfort and an unusually large amount of condensation forming on the inside of the bulkheads.

A Heating has always been necessary for colder areas of the world. This is done by heating coils. With extreme low temperature, these primitive methods of heating increased the capacity of circulated air to absorb moisture, thereby causing drying of nasal passages and crew discomfort. Therefore heating should be accompanied with humidification. If cooling is not assisted with dehumidification then it will result in large amount of condensation or sweating on bulkheads.