**Scheme – I**

## Sample Question Paper

**Program Name : Diploma in Chemical Engineering**
**Program Code : CH**
**Semester : Third**
**Course Title : Plant Utility**
**Marks : 70** **Time: 3 Hrs.**

**22311**

**Instructions:**

(1) All questions are compulsory.
(2) Illustrate your answers with neat sketches wherever necessary.
(3) Figures to the right indicate full marks.
(4) Assume suitable data if necessary.
(5) Preferably, write the answers in sequential order.

**Q.1) Attempt any FIVE of the following.** **10 Marks**

a) Define permanent hardness.
b) List out types of steam.
c) State different types of boiler
d) State the uses of compressed air in industry.
e) Define Dry bulb temperature and Wet bulb temperature.
f) Define coefficient of performance. (COP)
g) State the properties of Industrial water.

**Q.2) Attempt any THREE of the following.** **12 Marks**

a) Write the uses of Industrial water. (any four)
b) Distinguish between single stage and multistage air compressors (any four)
c) Sketch and explain the working of thermic fluid heater.
d) Describe vapour compression refrigeration cycle with neat labeled sketch.

**Q.3) Attempt any THREE of the following.** **12 Marks**

a) Write down chemical reaction in Lime Soda process for the softening of water .
b) Suggest type of industrial air required in combustion process and also explain method of formation of suggested type .
c). Name any four psychometric processes and represent them on psychometric chart.

d) Differentiate between water tube boiler and fire tube boiler. (any four)

**Q.4) Attempt any THREE of the following. 12 Marks**

a) Explain the working of Cyclone separator with labeled diagram

b) State the duties of Boiler Inspector

c) Explain the necessity of safety valve in boiler

d) State selection criteria for refrigerant

e) Differentiate between humidity and relative humidity. (any four)

**Q.5) Attempt any TWO of the following. 12 Marks**

a) Determine the amount of heat required to generate 5kg of steam at a pressure of 10 bar and temperature of 250 $^{o}$ C from the water at 25 $^{o}$ C .Take specific heat for superheated steam as 2.1 kJ/kg K.

b) A 5 tonne R12 plant maintains a cold store at –140 $^{o}$ C . The refrigerant flow rate is 0.13 kg /s . The vapour leaves the evaporators with 6 $^{o}$ C superheat. Cooling water available at 30 $^{o}$ C . A suction line heat exchanger subcools the refrigerant before throttling . Calculate

i) The compressor discharge temperature

ii) The COP

iii) The amount of subcooling

c) 50ml of a sample water consumed 15ml of 0.01 EDTA before boiling and 5ml of the same EDTA after boiling. Calculate the degree of hardness, permanent hardness and temporary.

**Q.6) Attempt any TWO of the following. 12 Marks**

a) Suggest a boiler for a small chemical industry which is in need of 500 kg/hour of steam at 12 atm .pressure Draw the sketch for such a boiler showing all mountings.

b) In a chemical process 200 m3 of air per minute at 15oC DBT and 75 % Relative Humidity is heated until its temperature is 25 0C. Find

i) Relative Humidity of heated air.

ii) Wet bulb temperature of heated air.

iii) Heat added to air per minute.

c) Suggest method of water softening in Textile industry and explain it.

**Scheme – I**

## Sample Test Paper - I

**Program Name : Diploma in Chemical Engineering**

**Program Code : CH**

**22311**

**Semester : Third**

**Course Title : Plant Utility**

**Marks : 20** **Time: 1 Hour.**

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**Instructions:**

(1) All questions are compulsory.

(2) Illustrate your answers with neat sketches wherever necessary.

(3) Figures to the right indicate full marks.

(4) Assume suitable data if necessary.

(5) Preferably, write the answers in sequential order.

**Q.1 Attempt any FOUR.** **08 Marks**

a) Define Temporary hardness.

b) List field application of Industrial water. (Any four)

c) State causes for scale formation in boiler. (Any two)

d) Define enthalpy of steam with its unit.

e) List out types of steam.

f) Define thermic fluid.

**Q.2 Attempt any THREE.** **12 Marks**

a) Explain constructional and operational details of the water level indicator with labeled sketch.

b) Describe Zeolite Process for the softening of boiler feed water.

c) Differentiate between water tube boiler and fire tube boiler.( any four) .

d) Write down chemical reaction in Ion Exchange process for softening of water

e) State selection criteria for thermic fluid. ( any four)

f) 5Calculate the temporary and total hardness of a water sample containing $Mg(HCO_3)_2$= 73mg/L, $Ca(HCO_3)_2$= 162mg/L, $MgCl_2$= 95mg/L, $CaSO_4$=136mg/L.

**Scheme – I**

## Sample Test Paper - II

**Program Name : Diploma in Chemical Engineering**
**Program Code : CH**
**Semester : Third**
**Course Title : Plant Utility**
**Marks : 20** **Time: 1 Hour.**

**22311**

**Instructions:**

(1) All questions are compulsory.
(2) Illustrate your answers with neat sketches wherever necessary.
(3) Figures to the right indicate full marks.
(4) Assume suitable data if necessary.
(5) Preferably, write the answers in sequential order.

**Q.1 Attempt any FOUR.** **08 Marks**

a) Define the terms Ton of Refrigeration.
b) Explain the term humidification.
c) Draw vapour absorption refrigeration cycle.
d) Define Relative humidity.
e) Define process air
f) Distinguish between single stage and multistage air compressors (any two)

**Q.2 Attempt any THREE.** **12Marks**

a) Enlist the methods of obtaining instrument air in industry
b) Distinguish between thermic fluid heater and steam boiler. (any four)
c) Sketch the schematics of refrigeration system on Bell – Coleman cycle and explain its working
d) Describe working of Single stage compressor.
e) Suggest refrigerant used in Frozen Food industry. (any four).
f) 200 $m^3$ of air per minute at 15$^oC$ DBT and 75 % Relative Humidity is heated until its temperature is 25 $^0C$ . Find
   i) Relative Humidity of heated air.
   ii) Wet bulb temperature of heated air.