



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE CHEMICAL PLANT OPERATION N5

2 August 2021

This marking guideline consists of 6 pages.

QUESTION 1

- 1.1 Heat energy
- 1.2 Heat required
- 1.3 Constituent elements
- 1.4 Particles of water
- 1.5 Pressure drop
- 1.6 Parallel
- 1.7 Blue flame
- 1.8 Rotating motion
- 1.9 Hydrogen chloride
- 1.10 Heavy dry powders

(10 × 2) [20]

QUESTION 2

2.1 $Q = m [\text{superheated steam} - \text{condensate}] \checkmark$
 $= m [hg + (Cp \Delta T) - hf] \checkmark$
 $= m [hg \text{ at } 4\,000 \text{ kPa} + (Cp \times (500 \text{ }^\circ\text{C} - t \text{ at } 4\,000 \text{ kPa}) - hf \text{ at } 100 \text{ Kpa}]$
 $= 1 [(2\,800 + (1,97 \times (500 - 250,3)) - 418] \checkmark \checkmark \text{ Steam tables}$
 $= 2\,873,9 \text{ kJ/kg} \checkmark$

(5)

2.2 2.2.1 The velocity-compounded turbine, called the Curtis turbine after its designer, is used to employ lower blade speeds \checkmark and a higher utilisation of the kinetic energy of the steam. \checkmark In this type of steam turbine, all the expansion or the entire pressure drop takes place in a single set of nozzles \checkmark and the steam then passes through a series of blades \checkmark attached to a single wheel or rotor. \checkmark

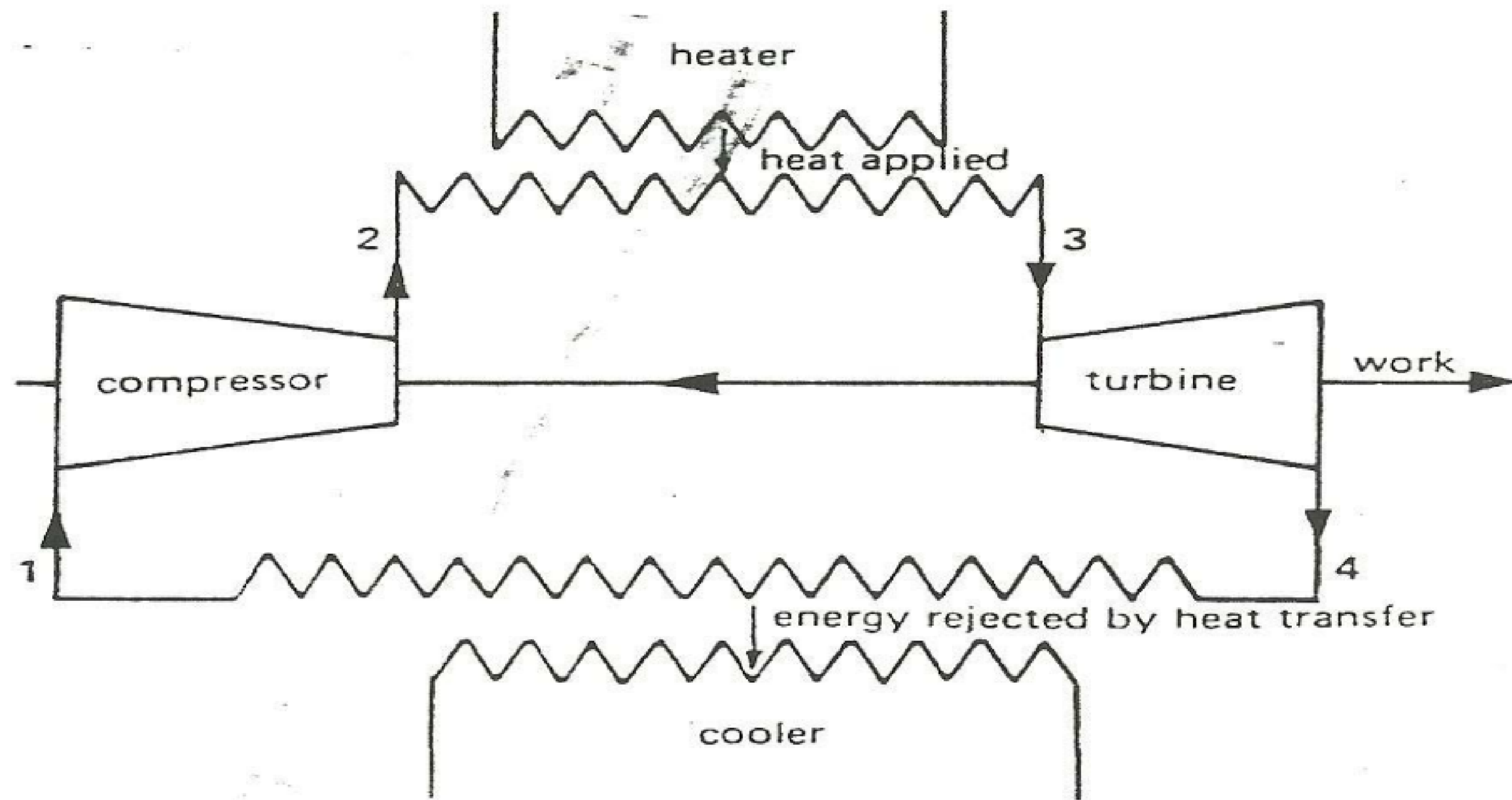
2.2.2 In a reaction turbine, only part of the pressure drop occurs in the nozzles. \checkmark The remainder occurs during the passage of the steam through the blades. \checkmark The blade passages are nozzle-shaped so that the acceleration requires a force (force = mass x acceleration) \checkmark and a resultant reaction occurs on the blades. \checkmark The force of the reaction is added to the force resulting from the redirection of the steam to cause the total propulsive force on the blades. \checkmark

(2 × 5)

(10)
[15]

QUESTION 3

3.1

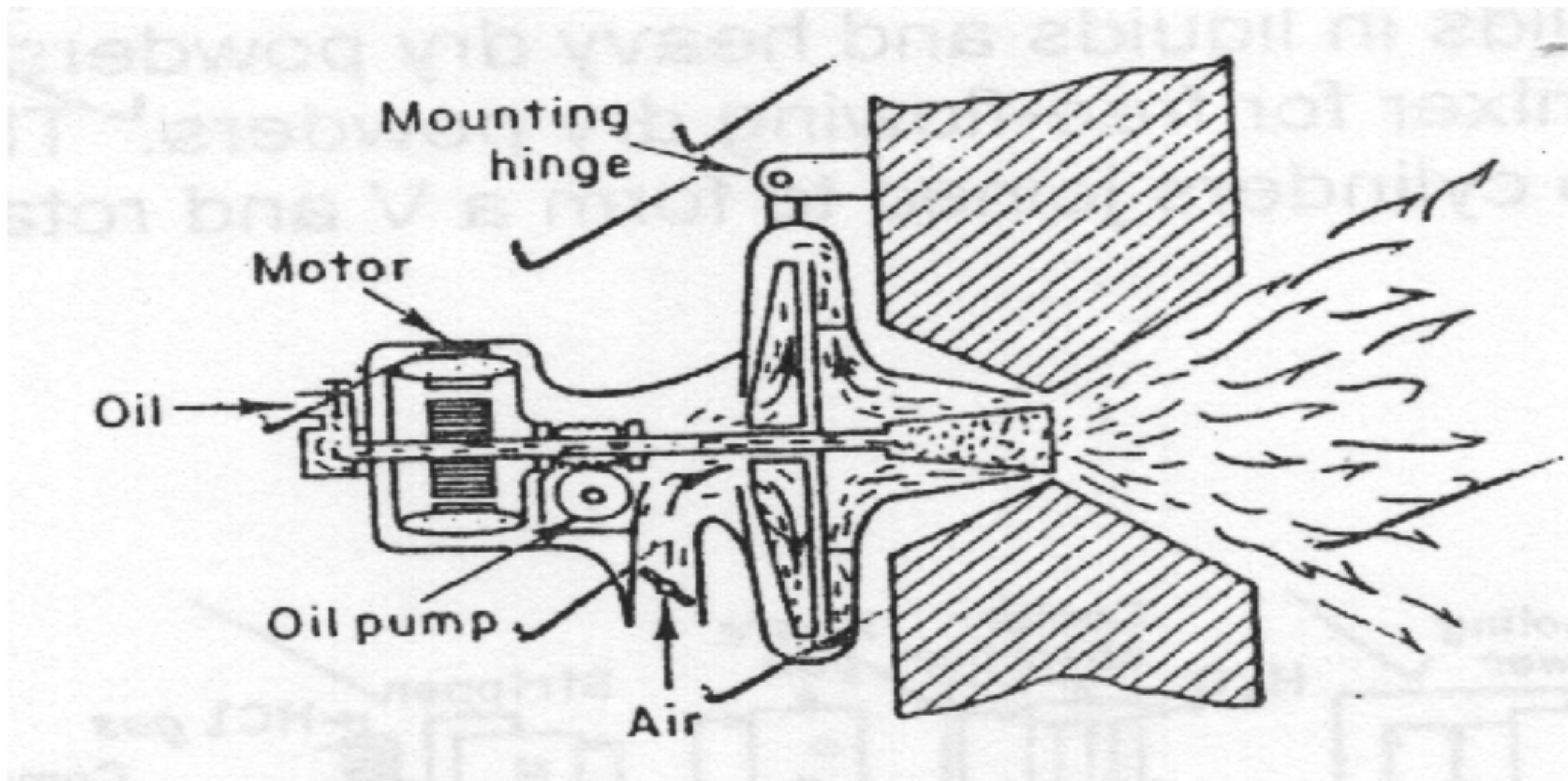


1 mark each for any SIX correct labels (6)

3.2

The fuel oil is preheated and then mixed with the air before sprayed in under pressure. ✓ Atomising oil burners spray the fuel from a nozzle or atomise it with air or steam. ✓ Combustion air surrounds the fuel nozzle and is blown into the furnace with the fuel spray. ✓ Vanes and baffles are built into the air stream to ensure proper air-fuel mixing. ✓

(4)



1 mark for each correct label (5)