higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

CHEMICAL PLANT OPERATION N5

24 November 2022

This marking guideline consists of 5 pages.

QUESTION 1

1.1 B
1.2 G
1.3 D
1.4 E
1.5 A

(5 × 1) **[5]**

QUESTION 2

2.1 2.1.1 The heat of reaction is the difference in energy between the products of the reaction and the reactants. (2)

2.1.2 The heat of reaction equals the sum of the heat of formation of the products minus the sum of the heat of formation of the reactants. (3)

2.1.3 Kinetic energy is created due to the motion (velocity) of an object. (2)

2.2 $\Delta H = nc_P (T_F - 25\ °C) - nc_P(T_I - 25\ °C)$✓
$= 10 \times 31{,}27(1\ 100 - 25)$✓ $- 10 \times 29{,}69(600 - 25)$✓
$= 336\ 152{,}5 - 170\ 717{,}5$✓
$= 165\ 435$ cal✓ (5)

2.3
- Identical casing and moving blades
- Height of the blades
- Area through which the steam flows (3)

[15]

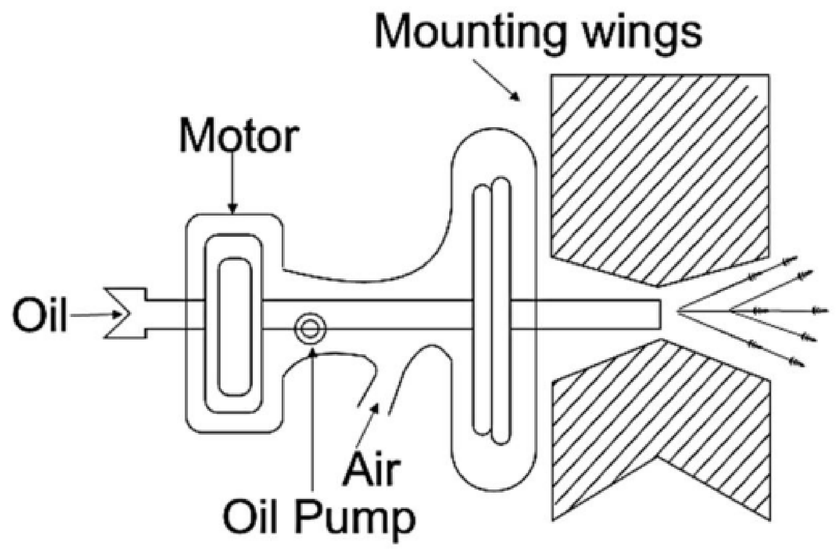
QUESTION 3

3.1 $CC\ell_4 + 2H_2O$✓ $\rightarrow$ CO_2✓ $+ 4HC\ell$✓ (3)

3.2 Advantage: The working agent remains free from pollution✓ by the products of combustion✓ and hence the interior of the plant remains clean.✓

Disadvantage: Large and costly heating✓ and cooling surfaces are needed✓ and air has to be pumped into the system to make up for leakage.✓ (3 + 3) (6)

3.3



(4 for correct labels + 1 for the correct drawing) (5)

3.4
- The common stigma blade✓ is used for general-purpose kneading.✓
- The double-naben or fish tale blade✓ is particularly effective with heavy plastic material.✓
- The dispersion blade✓ develops the high shear forces needed to disperse powders and liquid into plastic or rubbery masses.✓ (3 × 2) (6)

[20]

QUESTION 4

4.1
- Weight cylinder
- Floating weight
- Feed hopper door
- Extended neck
- Drilled sides
- Discharge door
- Door support
- Door latch

(Any 4 × 1) (4)

4.2 4.2.1 Steam flows from the centre outwards or from the outside towards the centre.✓ Pressure drops during the passage of steam through the nozzles✓ and then remains constant.✓ Velocity increases due to the pressure drop in the nozzles.✓ Velocity decreases as kinetic energy is given to the moving blades.✓ (5)

4.2.2 The shape of the nozzle must be such that the conversion from internal energy to kinetic energy is carried out with the greatest efficiency.✓ Nozzles are either converging or converging-diverging.✓ The minimum section of the nozzles is called the throat.✓ The corresponding pressure at the throat is called critical pressure.✓ If the discharge pressure is greater than the critical pressure,✓ converging nozzles are required.✓ If the discharge pressure is less than the critical pressure,✓ converging-diverging nozzles are required.✓ (8)

4.3 The nozzle converts the internal energy✓ of high-pressure steam into kinetic energy✓ so that the steam issues from the nozzles with high velocity.✓ (3)

[20]