



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE CHEMICAL PLANT OPERATION N5

8 July 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]

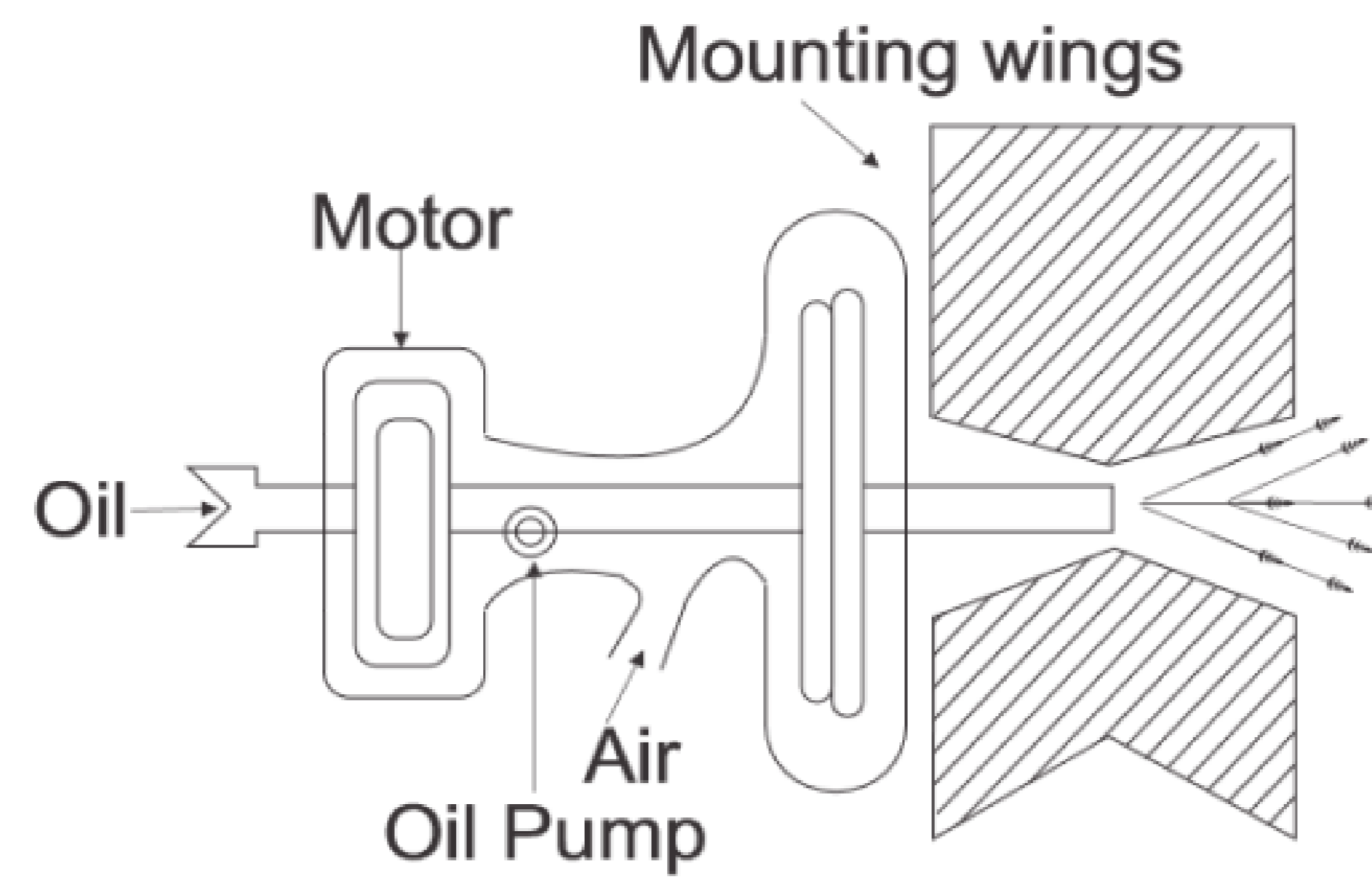
QUESTION 2

- 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 heats of formation of the products minus the sum of the heats of formation of the reactants. ✓✓✓ (3)
- 2.1.3 Kinetic energy is the energy as a result of the motion (velocity) of an object. ✓✓ (2)
- 2.2
$$\begin{aligned} \Delta H &= n_{CP} (T_F - 25 \text{ }^\circ\text{C}) - n_{CP} (T_I - 25 \text{ }^\circ\text{C}) \checkmark \\ &= 10 \times 31,27(1100 - 25) \checkmark - 10 \times 29,69(600 - 25) \checkmark \\ &= 336152,5 - 170717,5 \checkmark \\ &= 165\ 435 \text{ cal} \checkmark \end{aligned}$$
 (5)
- 2.3
- Casing and moving blades must be made identical
 - The height of the blades is an important factor
 - The area through which the steam flows
- (3)

[15]**QUESTION 3**

- 3.1 $\text{CCl}_4 + 2\text{H}_2\text{O} \checkmark \rightarrow \text{CO}_2 \checkmark + 4\text{HCl} \checkmark$ (3)
- 3.2 Advantages:
- The working agent remains free from pollution ✓ from the products of combustion ✓ and hence the interior of the plant remains clean. ✓
- Disadvantages:
- Large, costly heating ✓ and cooling surfaces are needed ✓ and air has to be pumped into the system to make up for leakage. ✓
- (6)

3.3



(Four marks for correct labels and 1 mark for the correct drawing) (5)

- 3.4
- The common sigma blade:✓ used for general-purpose kneading.✓
 - The double-naben or fishtail blade:✓ is particularly effective with heavy plastic material.✓
 - The dispersion blade:✓ develops high shear forces needed to disperse powders and liquid into plastic or rubbery masses.✓

(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 transferred to the moving blades.✓

(5)

- 4.2.2
- The shape of the nozzle must be such that the conversion from the internal energy to kinetic energy is carried out with 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 the 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)