higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

PROCESS TECHNOLOGY
NQF LEVEL 3

8 December 2020

This marking guideline consists of 5 pages.

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SECTION A

QUESTION 1

1.1 C
1.2 C
1.3 A
1.4 A
1.5 A

(5 × 1) **[5]**

QUESTION 2

2.1 E
2.2 J
2.3 F
2.4 A
2.5 D

(5 × 1) **[5]**

QUESTION 3

3.1 True
3.2 False
3.3 False
3.4 True
3.5 True

(5 × 2) **[10]**

TOTAL SECTION A: 20

SECTION B

QUESTION 4

4.1 4.1.1 It is a relative gentle mixing process where different components of similar materials are mixed together to make a product to specification

4.1.2
- A process where reactants are mixed together to form new products different from them
- A process where reagents are mixed together, reacting with each other to form something different from the starting materials (Any 1 × 2)

(2 × 2) (4)

4.2
- The ingredients to be mixed are measured and loaded into a mixer
- The ingredients are mixed for a predetermined period of time
- The mixture is discharged
- A new batch of ingredients is loaded into the mixer and the sequence is repeated (4)

4.3
- Mixing type
- Mixing time
- Material viscosity
- Turbulence
- Flow patterns (5)

4.4 $V_{prop}\%$ = ?
V_{H2O} = 320*l*
V_T = 460*l*
$V_T = V_{prop} + V_{H2O}$✓
460*l* = V_{prop} + 320*l*
V_{prop} = 460*l* - 320*l*✓
= 140*l*✓

$V\% = V_{prop}/V_T \times 100\%$✓
= 140l/460l × 100%✓
= 0.3043 × 100%✓
= 30.43%✓ (7)
[20]

QUESTION 5

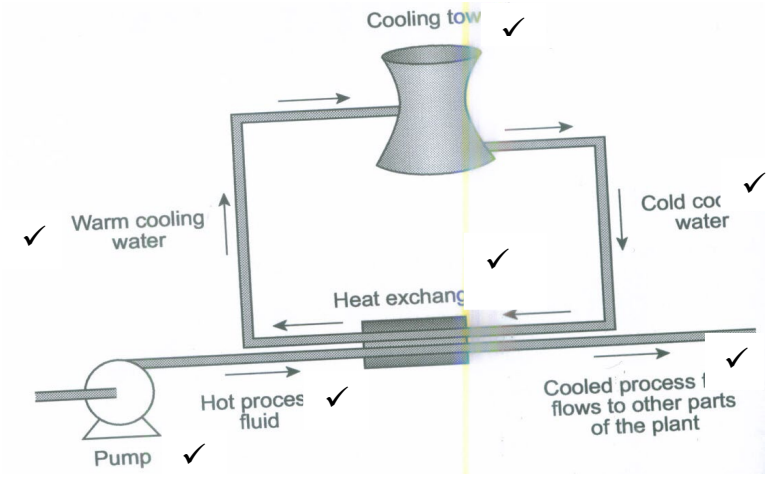
5.1
- Parallel flow
- Counter flow
- Cross flow (3)

5.2 One fluid flows inside the tubes while the other flows in the shell.✓ The two fluids are at different temperatures.✓ The hotter fluid passes through the tubes✓ while the colder fluid passes through the shell around the tubes.✓ As it is a surface heat exchanger, heat transfer occurs via the surface of the tubes.✓ Its large surface area provides for efficient heat transfer.✓ The baffles direct the fluid in the shell which increases the fluid velocity and the rate of heat transfer.✓ (7)

5.3 By choosing the correct fin type (2)

5.4 Plenum chamber is a slope-sided or box type enclosure✓ that helps with a smooth flow of air between the fan and the tube bundle.✓ In forced draft operation, it distributes the air delivered across the face of the tube bundle✓ while in induced draft operation, it delivers air from the top of the tube bundle to the fan intake.✓ Two types of plenum chambers are box-type which is mostly used for forced draft operation✓ whereas tapered-type is used for induced draft operation.✓ (6)

5.5



(7)

5.6
- How well the oxygen and fuel mix together
- How well the combustion process is kept alive through the igniters
- The time provided for the reaction to take place between fuel and air
- The removal of combustion products from the furnace so that new fuel and air can be introduced to burn

(4)
[29]

QUESTION 6

6.1 6.1.1 An equipment that removes water vapour from the gas flow

6.1.2 Impurities that must be removed from water to render it safe

6.1.3
- A process where the destabilised particles are induced to approach each other making contact and agglomerate forming flocs
- A process where positively charged flocculants are added in water that attract negatively charged colloids forming flocs

(Any 1 × 2)

6.1.4 It is a membrane separation process that removes high molecular-weight substances, colloidal materials and organic or inorganic polymeric molecules in solution

(4 × 2) (8)

6.2
- Hot air inlet
- Drying chamber
- Exhaust air outlet
- Product outlet
- Feed inlet
- High pressure

(6)

6.3 Physisorption/physical adsorption✓
No reaction of molecules and transfer of electrons✓
There are sites in the adsorbent that contain higher charges due to surface properties of the pores that attract molecules of the adsorbate✓
Weak Van der Waals that can be broken by heat or other methods of increasing kinetic energy of molecules are involved✓

Chemisorption/chemical adsorption✓
Adsorbent reacts with the adsorbate forming a chemical bond between the two exchanging electrons✓
Strong bonds are formed that are more stable at higher temperatures✓
Disadvantage of chemisorption is that the reaction can only take place up to a single molecule depth on the surface of the adsorbent✓

Electrostatic adsorption✓
Oppositely charged ions and functional groups bond due to the electrical charge differences between them and this is called ion exchange✓ (10)

6.4
- Flow meters
- Pressure gauges
- pH meters (3)

6.5
- Oxidation is the loss of electrons.
- Reduction is the gaining of electrons. (2 × 2) (4)

[31]

TOTAL SECTION B: 80
GRAND TOTAL: 100

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