

higher education & training

Department: Higher Education and Training REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

CHEMICAL PLANT OPERATION N6

3 APRIL 2018

This marking guideline consists of 5 pages.

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-2-CHEMICAL PLANT OPERATION N6

QUESTION 1

| 1.1 | True |
|-----|------|
| | |

- 1.2 False
- 1.3 True
- 1.4 True
- 1.5 False

(5 × 1) **[5]**

QUESTION 2

- 2.1 D
- 2.2 G
- 2.3 C
- 2.4 B
- 2.5 F

(5 × 1) **[5]**

QUESTION 3

| 3.1 | 3.1.1 | Filter cake ✓ – must be washed ✓ | |
|-----|-------|---|-----|
| | | If adsorbate is a desired product ✓ – solvent ✓ | |
| | | If adsorbate is volatile ✓ – passing steam or warm air through ✓ Adsorbate of volatile ✓ – burning off the adsorbate ✓ | |
| | | - | (8) |
| | 3.1.2 | • Type of adsorbent to be used depends upon solution to be | |

- .2 Type of adsorbent to be used depends upon solution to be treated.✓
 - Aqueous solution ✓ can be treated with activated carbon. ✓
 - Organic liquids ✓ can be treated with inorganic adsorbent such as clay. ✓
 - Mixed adsorbent can be used.✓
- 3.2 The temporarily stationary upper bed of solid is contracted with the liquid flowing downwards, so that fluidisation does not occur. ✓ In the lower bed, the solid is regenerated by an eluting liquid. ✓ After several minutes the liquid flow is stopped, ✓ valves are turned and the liquid-filled piston pump is removed for a period of several seconds, ✓ whereupon solid is removed clockwise hydraulically. ✓ With the valves readjusted to their original position, movement of solid is completed ✓ and liquid flows are started to complete the cycle. ✓

(7) [**21**]

(6)

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QUESTION 4

- 4.1 Turbo tray
 - Kittles tray
 - Ripple tray
 - Lava tray
- 4.2 VOLATILITY is defined as the equilibrium partial pressure of the substance in the vapour phase ✓ divided by the mole fraction of the substance in the liquid solution. ✓

RELATIVE VOLATILITY is defined as the volatility of one component of a liquid mixture \checkmark divided by the volatility of another component of the liquid mixture.

 (2×2) (4)

(4)

(3)

(2)

(2)

(4)

(4)

- 4.3 4.3.1 It is the percentage of isooctane mixture with normal heptane, \checkmark which as a sample of fuel \checkmark has the same knocking characteristics as the gasoline in question. \checkmark
 - 4.3.2 It refers to any light oil product having properties intermediate ✓ between gasoline and kerosene. ✓
- 4.4 4.4.1 It consists primarily of open-chain compounds ✓ and furnishes low octane number gasoline and excellent but waxy lubricating oil stocks.✓
 - 4.4.2 These crudes contain large quantities of both paraffinic ✓ and naphthenic compound ✓ and furnish medium grade straight-run gasoline and lubricating oil. ✓ Both wax and asphalt are found in these oils. ✓
 - 4.4.3 These crudes contain a high percentage of cyclic (naphthenic) compounds ✓ and furnish high octane number straight-run gasoline. ✓ The lubricating oil fraction must be solvent refined. ✓ Asphalt is present. ✓

4.5 • Light oil

- Carbolic oil
- Naphthalene oil
- Creosote oil
- Residue and anthracene
- Pitch tar or pitch

(Any 4 × 1) (4) [27]

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-4-CHEMICAL PLANT OPERATION N6 T330(E)(A3)T

QUESTION 5



They can be divided into two groups. In the first group, the light of the given wavelength from the hot body is optically matched \checkmark with the light from a constant comparison lamp in the instrument by means of an optical wedge or polarising system.

In the second group, which has now become by far the most popular, the brightness of the light from the calibrated comparison $lamp \checkmark$ is varied to match the light from the hot body. \checkmark The brightness of the lamp is judged to be the same as that of the source. The instrument is therefore known as the disappearing filament pyrometer. \checkmark

(5) **[21]**

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T330(E)(A3)T

(6)

QUESTION 6

6.1 The diaphragm box is suspended in the tank well above the sediment level. ✓ When the level of the liquid in the tank rises, ✓ the pressure on the diaphragm increases, ✓ and the diaphragm moves. ✓ This compresses the air within the closed system. ✓ The increased air pressure is transmitted by the capillary tube to the pressure-measuring portion of the instrument which may be an indicator or a recorder. ✓

6.2



S = Sampling chamber \checkmark

L = Linear variables transformer \checkmark

P = Plummet with metal core supporting chain 'C' \checkmark

R = Resistance thermometer \checkmark

(8)

(4)

(2)

- 6.3 6.3.1 The Rankine scale is the thermodynamic scale, but expressed in terms of Fahrenheit degrees. ✓ Thus the temperature of the triple point of water ✓ on the Rankine scale corresponding to 273,16 K ✓ is very nearly to 491,96 Rankine. ✓
 - 6.3.2 Celsius designated the ice point as 0 °C✓ and the steaming point as 100 °C.✓
- 6.4 Neutral

(1)

- [21]
- TOTAL: 100