



higher education
& training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE INSTRUMENT TRADE THEORY N2

1 AUGUST 2018

This marking guideline consists of 7 pages.

SECTION A**QUESTION 1**

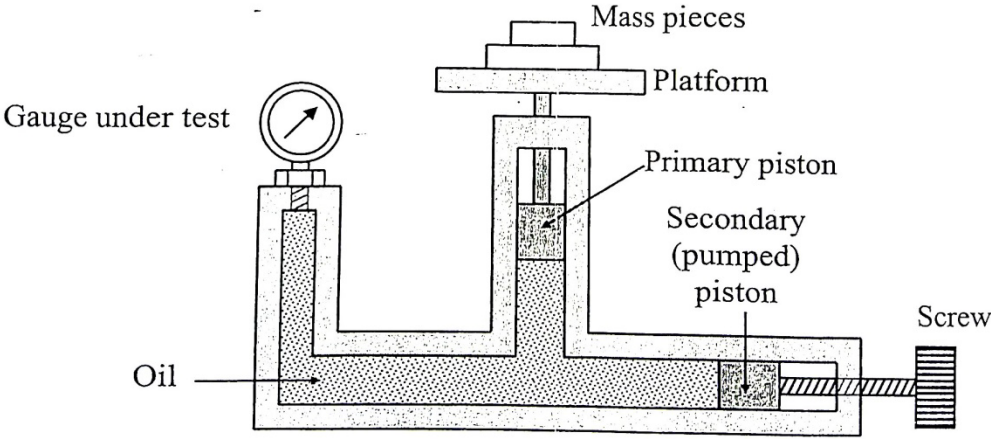
1.1	1.1.1	B	(5 × 1)	(5)
	1.1.2	B		
	1.1.3	B		
	1.1.4	A		
	1.1.5	B		
1.2	1.2.1	J	(10 × 1)	(10)
	1.2.2	E		
	1.2.3	D		
	1.2.4	A		
	1.2.5	B		
	1.2.6	M		
	1.2.7	C		
	1.2.8	L		
	1.2.9	G		
	1.2.10	F		
1.3	1.3.1	True	(5 × 1)	(5)
	1.3.2	False		
	1.3.3	True		
	1.3.4	True		
	1.3.5	True		
				[20]

TOTAL SECTION A: 20

SECTION B

QUESTION 2

- 2.1
- Parallax effect
The error in reading when the eye is not directly in line with a pointer whose tip is not in the same plane as the instrument scale
 - Capillary effect
When liquid creeps up in a narrow tube and it becomes difficult to read the level
- (5)

- 2.2
- 
- (ONE mark for each label) (6)

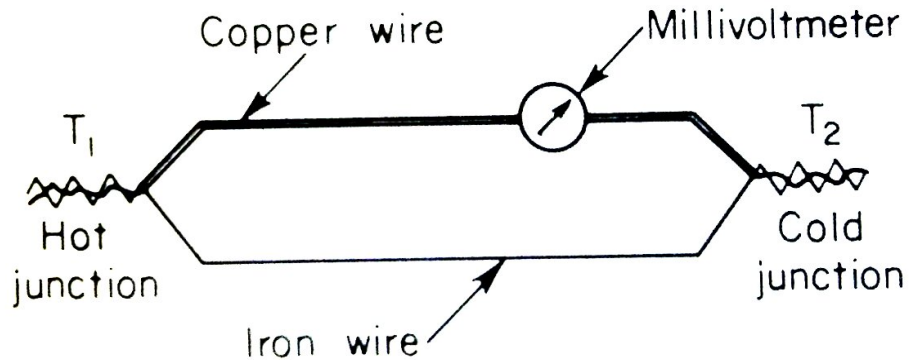
- 2.3
- $$P = \frac{Mg}{A} = \frac{20 \times 10}{0,1} = 2 \text{ Kpa}$$
- (3)

- 2.4
- Calibrating a manometer-type instrument with air
 - Calibrated to a higher differential pressure to compensate for density loss of the sealing liquid
- (2 + 2) (4)

- 2.5
- 2.5.1 Differential pressure is the difference between two pressures.
- 2.5.1 Gauge pressure is the pressure measured with the atmospheric pressure as its reference point.
- (2 × 1) (2)
- [20]**

QUESTION 3

3.1



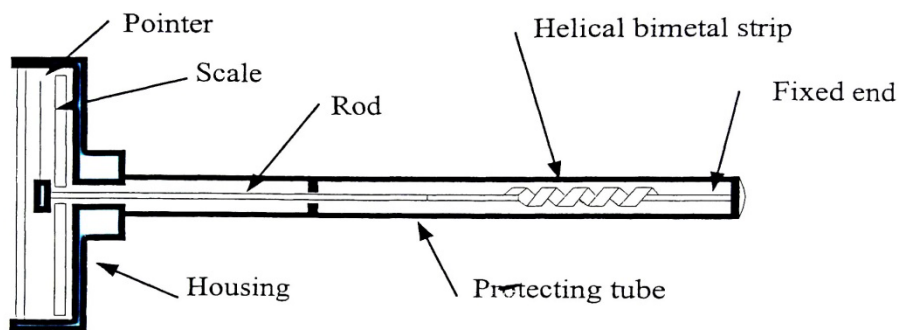
(ONE mark for each label) (5)

3.2

- Base metal thermocouples
- Noble metal thermocouples

(2)

3.3



(ONE mark for each label) (7)

3.4

- Three-lead (wire) method
- Four-lead (wire) method

(2)

3.5

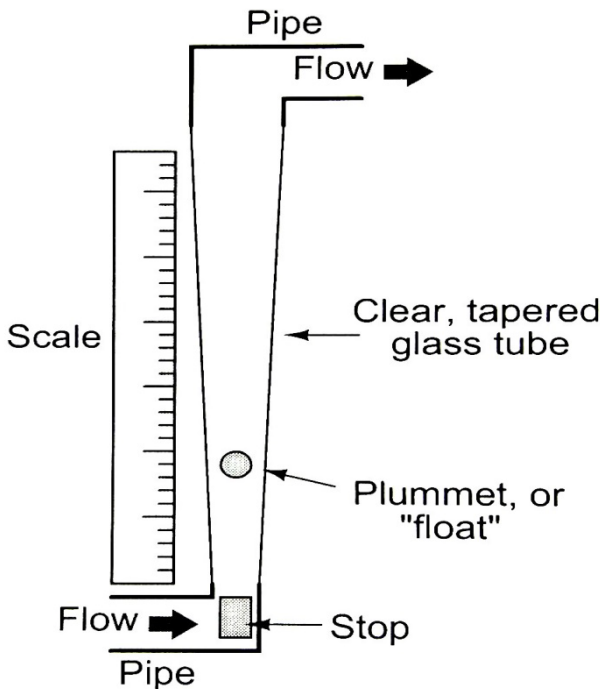
- Need for standardising voltage before measurements are taken
- Lead-wire resistance is added to the thermometer resistance giving a false temperature reading

(4)

[20]

QUESTION 4

- 4.1 They continuously measure the average velocity of the fluid stream✓ and then the volumetric flow rate is calculated by multiplying this velocity by the cross-sectional area of the pipe.✓✓ (3)

- 4.2
- 
- (ONE mark for each label) (5)

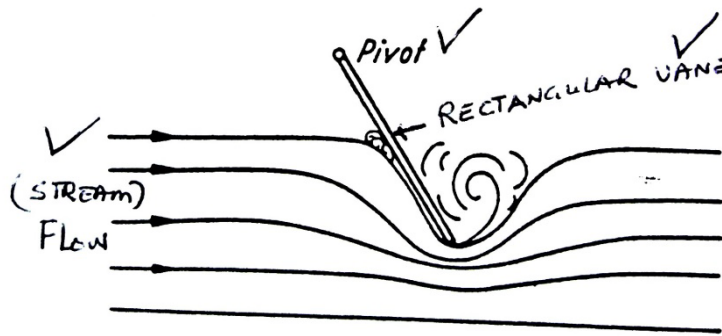
- 4.3 According to Bernoulli, $Q = k\sqrt{h}$

Thus at maximum flow $k = \frac{Q}{\sqrt{h}} = \frac{500}{\sqrt{16\,000}} = 126,4911✓$

Now if the flow rate is decreased to one half of the maximum, we have $Q = 250\text{ l/hr}✓$

$$h = \left(\frac{Q}{k}\right)^2 = \left(\frac{250}{126,4911}\right)^2 = 4 \text{ KPa}✓ \quad (3)$$

4.4

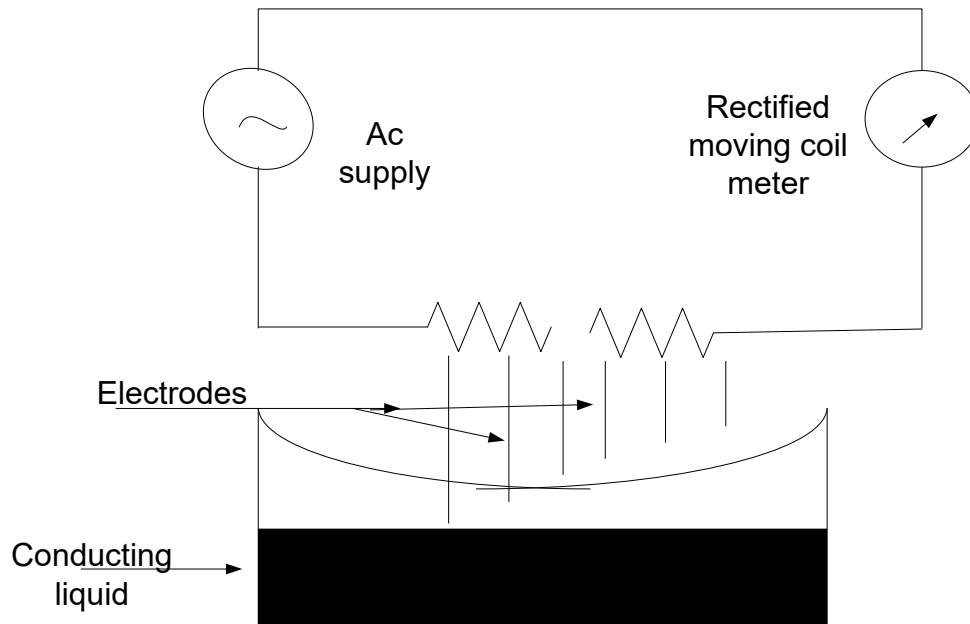


If a rectangular vane is freely pivoted about its upper edge,✓ and allowed to hang in a stream of liquid, it will tend to slow down the liquid stream and to deflect the liquid downwards so that the liquid will flow beneath the vane.✓ The vane will be in equilibrium under the forces acting on it.✓ Since the weight of the vane is constant, the angle through which it is deflected will depend upon the size of the force due to the impinging liquid.✓ The size of this force will depend upon the velocity of the stream.✓ For a liquid of given density, the angle through which the vane is deflected is a measure of the velocity of the stream in which it is placed.✓

(9)
[20]**QUESTION 5**

- 5.1
- Mechanical methods
 - Pneumatic techniques
 - Electrical methods
 - Nucleonic gauges
 - Ultrasonic systems
- (5)
- 5.2
- $$\Delta P = \rho g h$$
- $$h = \frac{\Delta P}{\rho g} = \frac{37\,000}{800 \times 10} \checkmark \checkmark$$
- $$= 4,625 \text{ m} \checkmark \checkmark$$
- (4)
- 5.3
- Pneumatic D/P
 - Electronic D/P
- (2)

5.4



The meter utilises the fact that many industrial liquids conduct electricity.✓
 Electrodes of different lengths are suspended from an insulated fixture✓
 projected into the liquid under level control. When the level rises or falls,✓
 the resistance will either increase or decrease accordingly.✓ This change in
 resistance is detected by an external circuit and is an indication of the level.✓

(9)
[20]

TOTAL SECTION B: 80
GRAND TOTAL: 100