higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

APRIL EXAMINATION

ENGINEERING SCIENCE N1

6 APRIL 2016

This marking guideline consists of 12 pages.

✓= 1 mark.
√ = ½ mark.

Calculations:

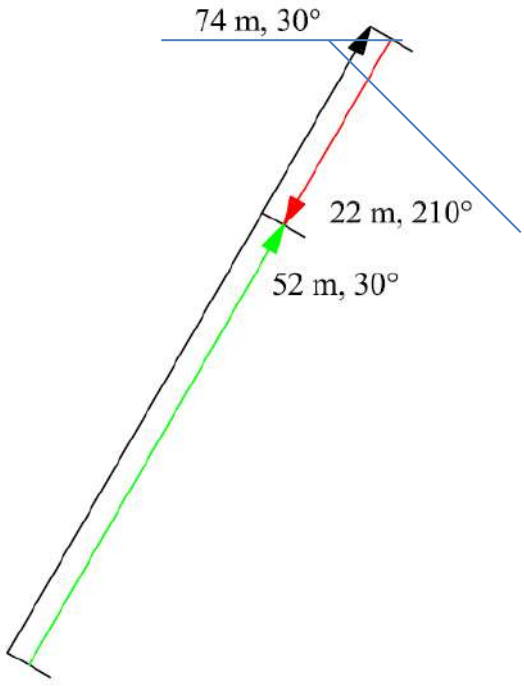
- 1 mark for substitution and conversion of values.
- 1 mark for answer and unit.
- -½ mark for using the incorrect unit.

QUESTION 1

1.1 1.1.1 C
1.1.2 D
1.1.3 B
1.1.4 A

(4 x 1) (4)

1.2



✓✓ Resultant = 52 m,30°✓ (2)

1.3 1.3.1

$$v = \frac{s}{t}$$

$$s = v.t$$ ✓✓

$$s = 375 \times (\frac{15}{60})$$

$$s = 93{,}75\ km$$

1.3.2

$$v = \frac{s}{t}$$

$$t = \frac{s}{v}$$

$$t = \frac{93{,}75}{375 \times 25\%}$$ ✓✓

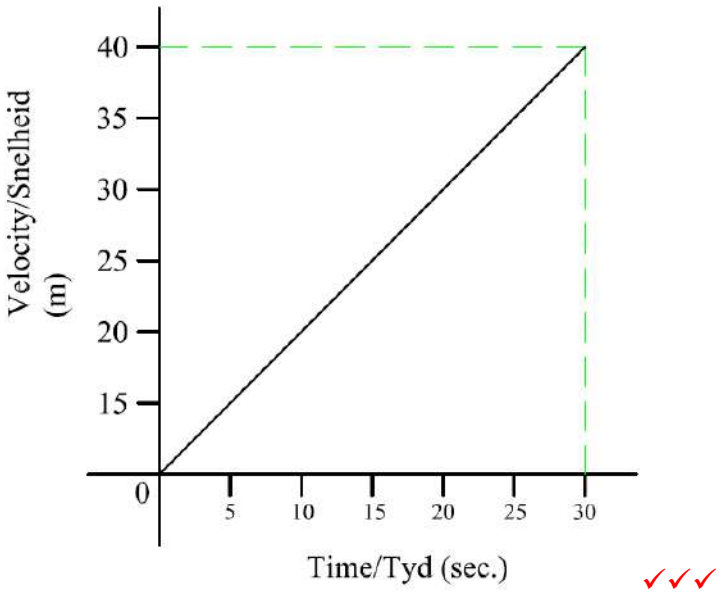
$$t = \frac{93{,}75}{468{,}75}$$

$$t = 0{,}2 \ hours$$

$$t = 12 \text{ min}$$

(2 x 2) (4)

1.4 1.4.1



✓✓✓ (3)

1.4.2

$$a = \frac{\Delta v}{t}$$

$$a = \frac{40}{30}$$ ✓✓

$$a = 1{,}333 \ m.s^{-2}$$

(2)
[15]

QUESTION 2

2.1
2.1.1 False
2.1.2 False
2.1.3 True
2.1.4 True
2.1.5 False

(5 x 1) (5)

2.2 2.2.1

$$VR = \frac{E_{Dist}}{L_{Dist}}$$

$$E_{Dist} = VR \times L_{Dist}$$ ✓✓

$$E_{Dist} = 3 \times 3{,}5$$

$$E_{Dist} = 10{,}5\ m$$

2.2.2

$$MA = \frac{L}{E}$$

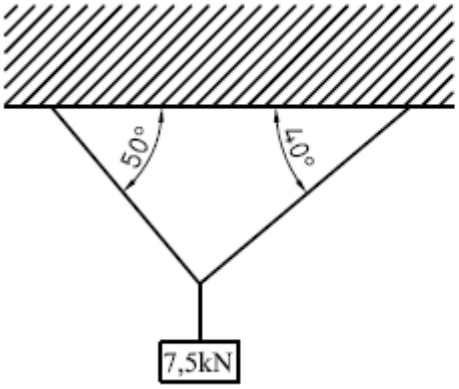
$$E = \frac{L}{MA}$$ ✓✓

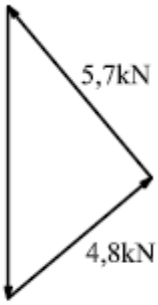
$$E = \frac{550}{2{,}5}$$

$$E = 220\ N$$

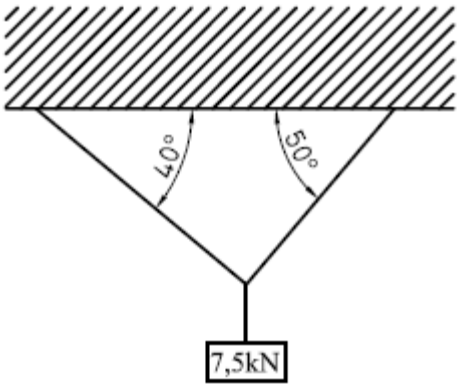
(2 x 2) (4)

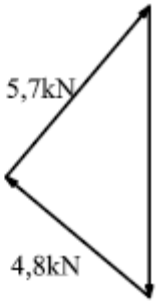
2.3





✓✓✓





OR

By calculations

Consider both A and B up

	A	B	125N
x	- A cos 40^0 = -0,766A	B Cos 50^0 = 0,643B	0
Y	A sin 40^0 = 0,643	B sin 50^0 = 0.766B	-125

$\sum x = 0$

$-0{,}766A + 0{,}643B = 0$

B = 1.191A

1

$\sum y = 0$

0,643A + 0,766B = 7,5

2

1 in 2

0,643A + 0,766 x 1,191A = 7,5

A = 4.823N

Therefore B = 1.191 x 4,823 = 5,744 kN ✓✓✓ (3)

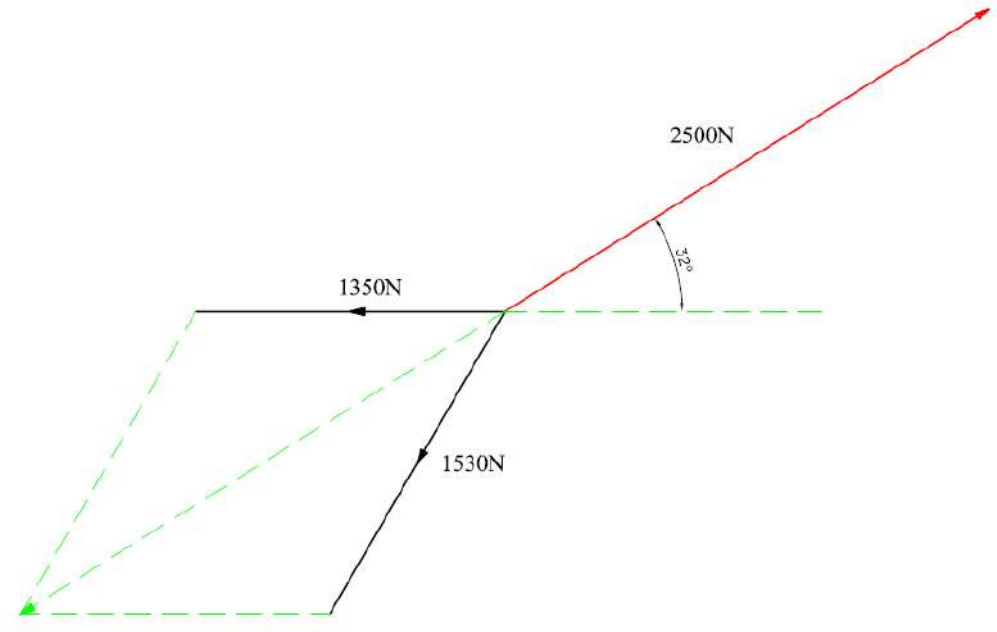
2.4 $LM = RM$

$P \times 3 = 125 \times 2$

$P = \frac{125 \times 2}{3}$ ✓✓

$P = 83{,}333\ N$ (2)

2.5



✓✓

Equilibrant = 2500N East 32°North✓

OR

By calculations

(3)
[17]

QUESTION 3

3.1

3.1.1	B
3.1.2	A
3.1.3	B
3.1.4	A
3.1.5	B

(5 x 1) (5)

3.2 $W = F \times s$

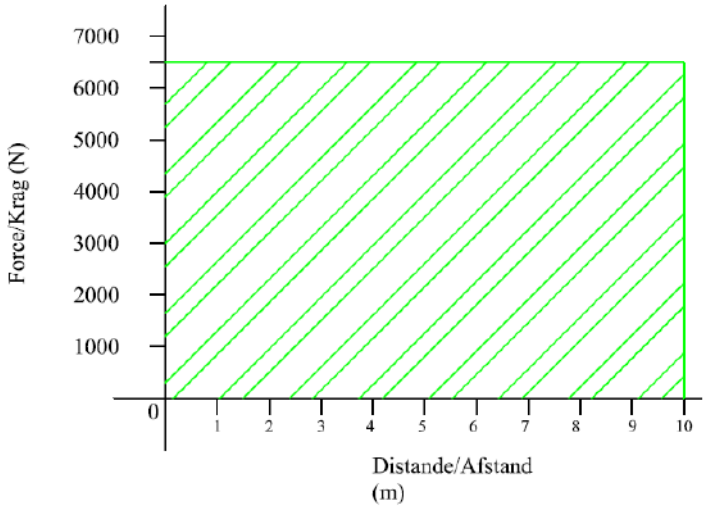
$W = 525 \times 200$ ✓✓

$W = 105\ 000$

$W = 105\ kJ$

(2)

3.3 3.3.1



✓✓✓ (3)

3.3.2 $W = F \times s$

$W = 6\,500 \times 10$ ✓✓

$W = 650\,00\ J$

$W = 65\ kJ$

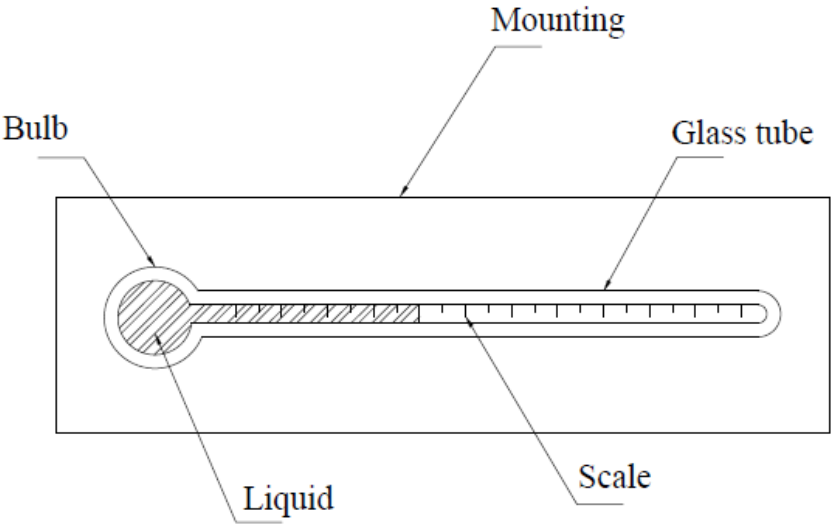
(2)
[12]

QUESTION 4

4.1 4.1.1 Higher
4.1.2 Lower
4.1.3 Removed
4.1.4 Radiation pyrometer
4.1.5 Joule

(5 x 1) (5)

4.2



✓✓✓ (3)

4.3 4.3.1 Conduction
4.3.2 Convection
4.3.3 Convection/radiation

(3 x 1) (3)

4.4 $Q = m \times c \times \Delta t$
$Q = 250 \times 4187 \times (55 - 15)$ ✓✓
$Q = 418\ 700\ \ 00\ J$
$Q = 41{,}87\ MJ$

(2)

4.5 4.5.1 $\Delta l = l_o - l_f$
$\Delta l = 36 - 35{,}105$ ✓
$\Delta l = 0{,}895m$
$\Delta l = 895\ mm$

4.5.2 $\Delta t = t_o - t_f$
$\Delta t = 85 - 25$ ✓
$\Delta t = 60\ ^\circ C$

(2 x 1) (2)

4.6 4.6.1 Heat is transferred between the lead and water.
4.6.2 The law of conservation of energy.
4.6.3 The temperature of both materials is the same.

(3 x 1) (3)
[18]

QUESTION 5

5.1 5.1.1 Atom
5.1.2 Matter
5.1.3 Molecule
5.1.4 Melting
5.1.5 Condensation

(5 x 1) (5)

5.2 Gas: particles far from each other
Liquid: particles not far from each other
Solid: particles close to each other (3)

5.3 Electron – negative
Neutrons – neutral
Proton – positive (3)

5.4 When an atom has gained or lost an electron. ✓ (1)

[12]

QUESTION 6

6.1
6.1.1 C
6.1.2 D
6.1.3 A
6.1.4 E
6.1.5 B

(5 x 1) (5)

6.2
6.2.1 Insulator – is a material that prevents the flow of electrical current.

6.2.2 Resistance – is a material that resists the flow of electrical current.

6.2.3 Potential difference – is the electrical pressure required to overcome the resistance in order for a current to flow.

6.2.4 Joule's Law – the quantity of heat generated by an electrical current is directly proportional to ???? Is something not missing here?

(4 x 1) (4)

6.3
6.3.1

$$\frac{1}{R_t} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\frac{1}{R_t} = \frac{1}{125} + \frac{1}{230}$$ ✓✓

$$\underline{\underline{R_t = 80,986\Omega}}$$

6.3.2

$$I = \frac{V}{R}$$

$$I = \frac{24}{80,986}$$ ✓✓

$$I = 0,296A$$

$$\underline{\underline{I = 296mA}}$$

6.3.3

$$P = V \times I$$

$$P = 24 \times 0,296$$

$$\underline{\underline{P = 7,104W}}$$

OR

$$P = I^2R$$

$$P = 0,296^2 \times 80,986$$

$$\underline{\underline{P = 7,096W}}$$

OR

$$P = \frac{V^2}{R}$$

$$P = \frac{24^2}{80,986}$$ ✓✓

$$\underline{\underline{P = 7,112W}}$$

(3 x 2) (6)

6.4 6.4.1 Resistivity – Different metals have different resistances.

6.4.2 Length – The longer the conductor, the higher the resistance.

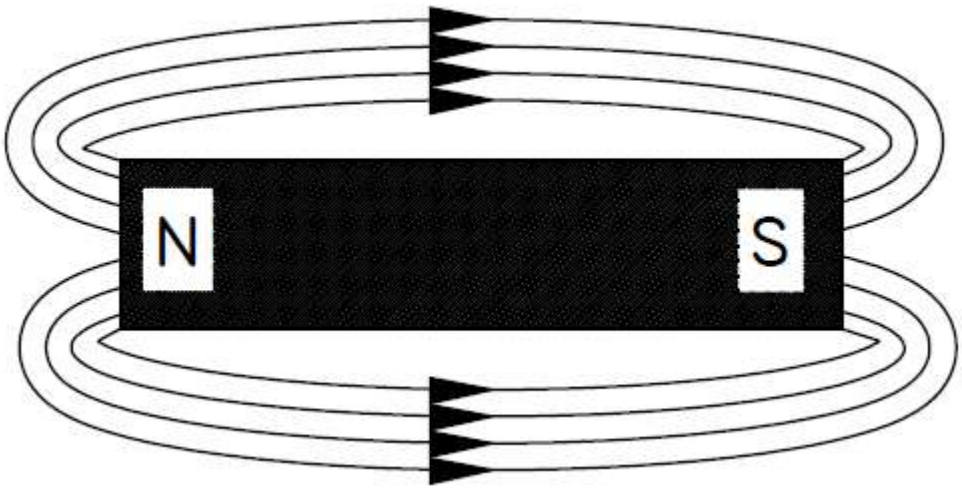
(2 x 1) (2)

6.5 6.5.1 Alloys – no change in resistance.✓

6.5.2 Insulators – The resistance decreases with the rise in temperature.✓

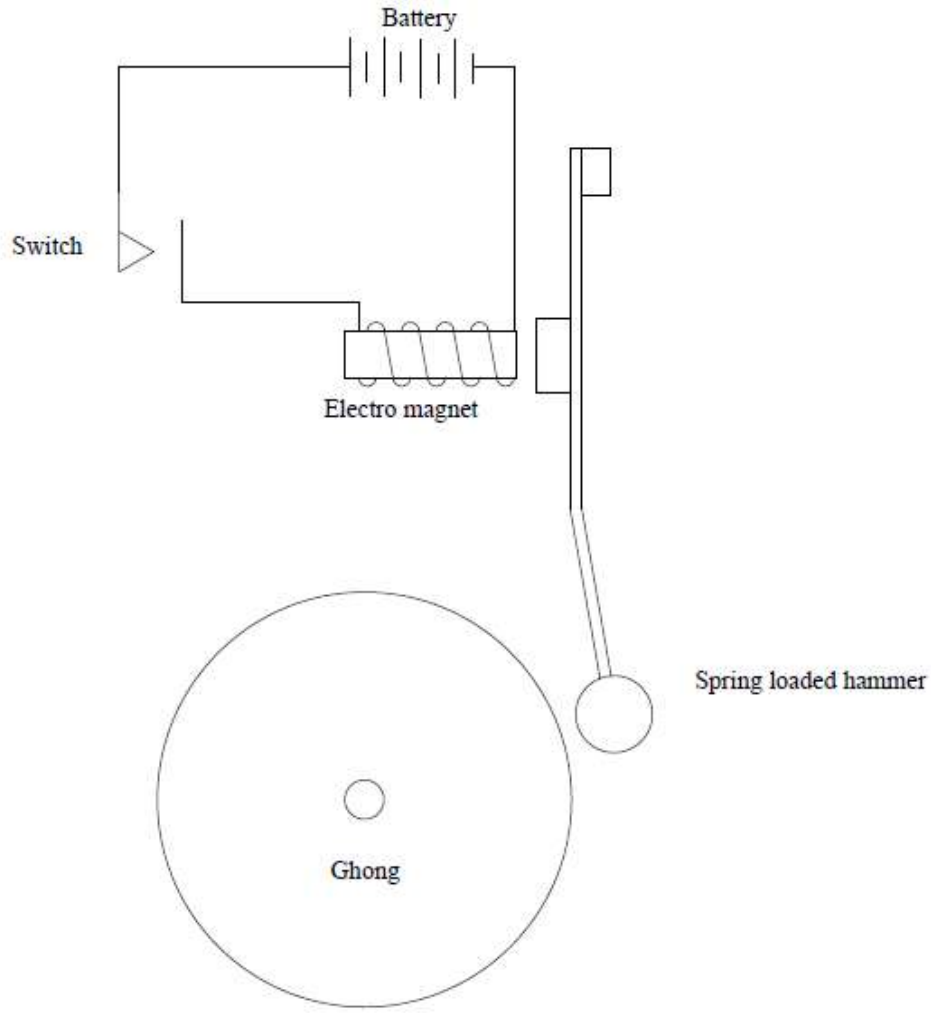
(2 x 1) (2)

6.6



✓✓✓ (3)

6.7



✓✓✓✓ (4)

[26]

TOTAL: 100