GAUTENG PROVINCE
Department: Education
REPUBLIC OF SOUTH AFRICA

AMENDMENT TO MARKING GUIDELINES

PREPARATORY EXAMINATION /
VOORBEREIDENDE EKSAMEN 2023

FOR ATTENTION / *VIR AANDAG*:
THE CHIEF INVIGILATOR / *DIE HOOF TOESIGHOUER*

SUBJECT / *VAK*	TECHNICAL SCIENCES/*TEGNIESE WETENSKAPPE*
SUBJECT CODE / *VAKKODE*	11101
PAPER / *VRAESTEL*	1
DATE OF EXAMINATION / *DATUM VAN EKSAMEN*	22 SEPTEMBER 2023

The TECHNICAL SCIENCES/*TEGNIESE WETENSKAPPE* **(Paper 1 / *Vraestel* 1)** written on **22 September 2023** has reference. It has come to our attention that there was an anomaly on the data sheet which impacted on questions 6.1.3, 6.1.4 and 6.1.6.

To ensure that your candidates are not disadvantaged and prejudiced in way, you are advised to please ask Educators to ignore the above-mentioned questions.

In other words, the paper must be marked out of a total of 140 instead of 150 and then the learners' marks must be converted back to a mark out of 150. E.g., Should a learner have attained 80/140, then that mark is recalculated as 86/150.

Use the formula: $\dfrac{a}{140} \times 100 = b$. Then, $\dfrac{b}{100} \times 150 = c$

c is the mark that is entered into SASAMS **out of 150**.

_____
Mr. Jonathan Williams

DIRECTOR: EXAMINATIONS MANAGEMENT
22 September 2023

GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PREPARATORY EXAMINATION

2023

MARKING GUIDELINES

| TECHNICAL SCIENCES (PAPER 1) (11101) |

9 pages

QUESTION 1: MULTIPLE-CHOICE QUESTIONS

1.1   C ✓✓   (2)

1.2   A ✓✓   (2)

1.3   B ✓✓   (2)

1.4   C ✓✓   (2)

1.5   A ✓✓   (2)

1.6   D ✓✓   (2)

1.7   C ✓✓   (2)

1.8   B ✓✓   (2)

1.9   D ✓✓   (2)

1.10   B ✓✓   (2)
                                                                                                   [20]
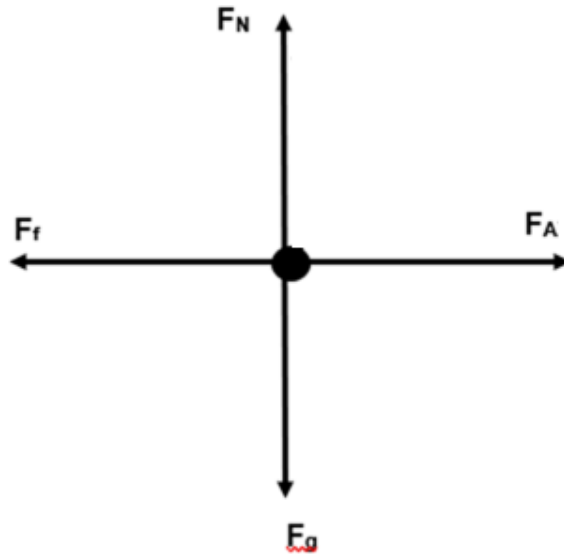
QUESTION 2: MATCHING ITEMS

2.1   D ✓   (1)

2.2   H ✓   (1)

2.3   A ✓   (1)

2.4   F ✓   (1)

2.5   B ✓   (1)

2.6   G ✓   (1)

2.7   C ✓   (1)

2.8   E ✓   (1)
                                                                                                    [8]

QUESTION 3

3.1 3.1.1 The force parallel to the surface that opposes the motion of an object and acts in the direction opposite to the motion the object. ✓✓   (2)

    3.1.2

                    F_A must not be equal or same length with F_f (-1)

Symbols	Name	Mark allocation
F_f, f, F_K	Force of friction	✓
F_g, W,	Gravitational force	✓
F_A, F	Applied force	✓
F_N, N	Normal force	✓

                                                                         (4)

   3.1.3 F_{net} = ma $\quad$✓
          F_A – F_f – = ma
          $\underline{F_A – 750}$ ✓ = $\underline{960 \times 2}$ ✓
          F_A = 1 920 + 750
              = 2670 N to the right ✓   (4)

   3.1.4 F_g = 960 x 9,8 ✓
              = 9408 N ✓   (2)

3.2 3.2.1 When a net/resultant force is applied to an object of mass m, it accelerates the object in the direction of the net force. The acceleration is directly proportional to the net/resultant force and inversely proportional to the mass of the object. ✓✓ (2)

3.2.2 5 forces ✓ or 5 ✓ (1)

3.2.3 $F_{net} = ma$
$F_H + F_{Dx} - F_f = ma$ ⎫
$F_H + F_D \cos \Theta - F_f = ma$ ⎬ ✓
$\underline{120 + 180 \cos 15° - 100}$ ✓ $= \underline{70a}$ ✓
$193{,}87 = 70a$
$a = 2{,}77$ m·s⁻² to the right ✓ (4)

3.2.4 DECREASE ✓ (1)

[20]

QUESTION 4

4.1 4.1.1 It is the product of the net force and the time interval for which the net force acts on the body. ✓✓ (2)

4.1.2
1 kg = 1 000 g   1 kg : 10³ g
$\underline{1 \text{ kg}} = \underline{1\ 000 \text{ g}}$ x : 150 g
$1000 \quad 1\ 000$ **OR** $x = \dfrac{150}{10^3}$
1 g = 0,001 kg
150 g = 0,15 kg ✓✓   = 150 × 10⁻³ kg ✓✓ (2)

4.1.3 DECREASE ✓ (1)

4.1.4 Option 1   Option 2

Option 1	Option 2
$F_{net} \Delta t = mv_f - mv_i = \Delta p$ ✓ $= \underline{0{,}15(32 - (-50))}$ ✓ $0{,}012$ ✓ $= 1\ 025$ N towards the wall ✓	$F_{net} \Delta t = mv_f - mv_i = \Delta p$ ✓ $= \underline{0{,}15(-32 - (+50))}$ ✓ $0{,}012$ ✓ $= -1\ 025$ N away from the wall ✓

(4)

4.2 4.2.1 From $F_{net} = \dfrac{\Delta p}{\Delta t}$

The air bag causes the delay of impact by increasing the time of impact and decreasing the net force. ✓✓ (2)

4.2.2 Increase in velocity will increase the impulse since the impulse is directly proportional to the velocity. ✓✓ (2)

[13]

4

QUESTION 5

5.1 Work done is the product of the applied force on an object and the displacement in the direction of the force. ✓✓ (2)

5.2 $W = F \Delta x \cos \Theta$ ✓
     $= 5 \times 3 \cos 0°$ ✓
     $= 15$ J ✓ (3)

5.3   5.3.1   The principle of conservation of mechanical energy: The total mechanical energy (sum of gravitational potential energy and kinetic energy) in an isolated system remains constant. ✓✓ (2)

     5.3.2 $E_K = \frac{1}{2}mv^2$ ✓
          $= \frac{1}{2} \times 2 \times 1{,}5^2$ ✓
          $= 2{,}25$ J ✓ (3)

     5.3.3 $E_P = mgh$ ✓
          $= 2 \times 9{,}8 \times 0{,}5$ ✓
          $= 9{,}8$ J ✓ (3)

     5.3.4   **positive marking from 5.3.2 and 5.3.3**
         $ME_{top} = ME_{bottom}$ ⎫
         $(\frac{1}{2}mv^2 + mgh)_{top} = (\frac{1}{2}mv^2 + mgh)_{bottom}$ ⎬ ✓
         $\underline{\frac{1}{2} \times 2 \times 1{,}5^2 + 2 \times 9{,}8 \times 0{,}5}$ ✓ $= \underline{\frac{1}{2} \times 2 \times v^2}$ ✓ $+ \underline{2 \times 9{,}8 \times 0}$ ✓
         $2{,}25 + 9{,}8 = v^2 + 0$
         $v^2 = 12{,}05$
         $v = 3{,}47$ m·s^{-1} ✓ (5)

                                                [18]

QUESTION 6

6.1   6.1.1   Deforming force is a force that changes the shape and size of a body. ✓✓ (2)

     6.1.2   Area $= \pi r^2$ ✓
          $= 3{,}14 \times 0{,}03^2$ ✓
          $= 0{,}0028$ m^2 ✓ ($2{,}83 \times 10^{-3}$ m^2) (3)

     6.1.3 $\sigma = \dfrac{F}{A}$ ✓   <mark>(do not mark)</mark> Due to Data sheet
          $= \dfrac{6\ 000}{0{,}0028}$ ✓
          $= 2\ 142\ 857{,}14$
          $= 2{,}14 \times 10^6$ N.m^{-2} ✓ (3)

     6.1.4 $\varepsilon = \dfrac{\Delta L}{l}$ ✓   <mark>(do not mark)</mark> Due to Data sheet
          $= \dfrac{0{,}01}{3}$ ✓
          $= 0{,}0033$ ✓ <mark>($3{,}33 \times 10^{-3}$)</mark> (3)

6.1.5 Hooke's law states that, within the limit of elasticity, stress is directly proportional to the strain. ✓✓ (2)

6.1.6 K = $\underline{\sigma}$ ✓ (do not mark) Due to Data sheet
      ε

   = $\underline{2,14 \times 10^6}$ ✓
      0,0033 ✓

   = 648 484 848.5

   = $6,48 \times 10^8$ Pa or N.m^{-2} ✓ (4)

6.2 6.2.1 Viscosity is the property of the fluid to oppose relative motion between the two adjacent layers. ✓✓ (2)

6.2.2 5W-40 ✓ (1)

6.2.3 As the temperature decreases, the viscosity increase. ✓ (1)

6.2.4 5W-20 ✓ (1)

6.2.5
- To reduce wear on the moving parts
- Cleans the moving parts
- Reduces corrosion
- Cools the engine
- Improves sealing

(Any ONE) ✓ (1)

Mark this question out of 13 marks **[13]**

QUESTION 7

7.1 Capacitance of a capacitor is the amount of charge it can store per volt. ✓✓ (2)

7.2 C = $\underline{Q}$
      V

   = $\underline{10 - 5}$ ✓   **OR**   Any two pairs of coordinates can be used to
      4 – 2 ✓   calculate capacitance (gradient may be used/ any
                           value may be used from the graph)

   = 2,5 C.V^{-1} (F) ✓ (3)

7.3 The charge is directly proportional to potential difference. **OR**
    As the charge increases, the potential difference increases. ✓✓ (2)

7.4
- Filter circuits in power supplies
- Separation of frequencies between the woofer (base) speaker and tweeter (high pitch) speaker/electronic noise filtering
- Power factor correction/improvement in electrical transmission systems

(Any TWO) ✓✓ (2)

[9]

QUESTION 8

8.1 Ohm's law states that: The potential difference across a conductor is directly proportional to the current in the conductor at constant temperature. ✓✓ (2)

8.2 8.2.1 $\dfrac{1}{R_{eq}} = \dfrac{1}{R_1} + \dfrac{1}{R_2}$ ✓

$= \dfrac{1}{4} + \dfrac{1}{2}$ ✓

$= \dfrac{3}{4}$

$R_{eq} = 1,33\ \Omega$

$R_{total} = R_{eq} + R_s$ ✓

$= 1,33 + 3$

$= 4,33\ \Omega$ ✓

(4)

8.2.2 $R_T = \dfrac{V_T}{I_T}$ ✓

$4,33 = \dfrac{12}{I_T}$ ✓

$I_T = \dfrac{12}{4,33}$

$= 2,77\ A$ ✓

(3)

8.2.3 $R_{eq} = \dfrac{V}{I}$ | $V = IR$

$1,33$ ✓ $= \dfrac{V}{2,77}$ ✓ | $= (2,77)(3)$

   | $= 8,31$

$V = 1,33 \times 2,77$ | $12 - 8,31$

$= 3,68\ V$ ✓ | $= 3,69\ V$

(3)

8.2.4 **Option 1**

12 V – 3,68 V = 8, 32 V ✓ <mark>(positive marking from previous questions)</mark>

$P = VI$ ✓

$= 8,32 \times 2,77$ ✓

$= 23,05\ W$ ✓

Option 2

$P = V^2 / R$

$= 8,32^2 / 3$

$= 23,07\ W$

Option 3

$P = I^2 \times R$

$= 2,77^2 \times 3$

$= 23,02\ W$

(4)

8.3 INCREASE ✓

NEGATIVE MARKING (2)

7

The effective resistance decreases✓

[18]

11101/23

QUESTION 9

9.1
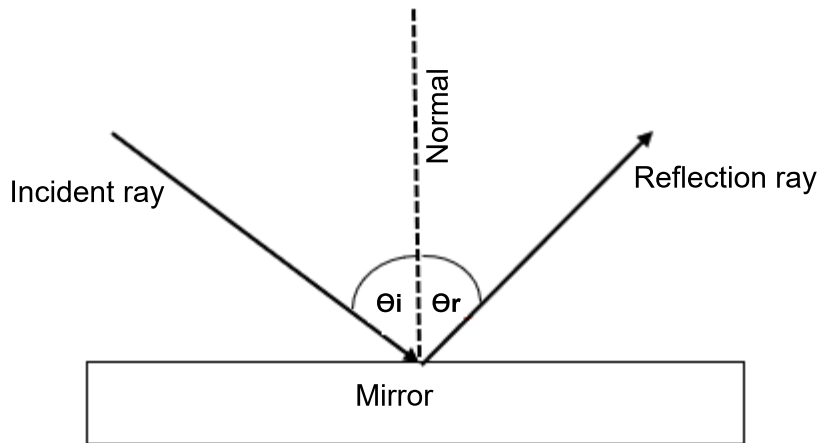
Angle of Incident	✓
Reflected beam	✓
Normal	✓
Incident beam	✓
Angle of reflection	✓

(If the arrow is not shown – 1 mark)

(5)

9.2 Critical angle: The critical angle is measured when the incident ray passes from an optically more dense to an optically less dense medium, such that the refracted ray just passes through the surface of the two media. ✓✓

OR

The critical angle is the angle incidence where the angle of refraction is 90°. The refracted beam then travels along the boundary between the two media.✓✓ (2)

9.3 Dispersion: The phenomenon whereby (white) light breaks up into its component colours. ✓✓ (Award the marks in Afrikaans) (2)

9.4 When light travels from air to water, it moves from a less dense to an optically ✓ denser medium. The colour of the light is determined by frequency ✓ and the colour of light does not change, but the speed of the light and the wavelength decrease. ✓ (3)

[12]

QUESTION 10

10.1   Electromagnetic wave: A change of a magnetic and an electric field
perpendicular to each other and to the direction of propagation of the
wave ✓✓   (2)

10.2   • EM waves move at a constant speed.
        • EM waves do not need a medium.
        • They have properties of waves.
        • EM waves have particle properties.
        • EM waves are transverse waves.
        (Any 4) ✓✓✓✓   (4)

10.3   X-rays/Gamma rays ✓
Infrared for Physiotherapy.
UV rays to sterilize equipment.
Marker may use own discretion on equipment or places within context.
                                                                                    (1)

10.4   X-rays are used to ascertain if there are bone fractures.
Gamma rays are used to treat cancer.
Marker may use own discretion on equipment context.

(Look at 10.3's answer) ✓✓   (2)
                                                                                    [9]

                                                            TOTAL: **140**