**GAUTENG PROVINCE**
EDUCATION
REPUBLIC OF SOUTH AFRICA

# PREPARATORY EXAMINATION

# 2019

## MARKING GUIDELINES

# TECHNICAL SCIENCES Q1

# 11101

**11 pages**

**GAUTENG DEPARTMENT OF EDUCATION**

**PREPARATORY EXAMINATION**

**TECHNICAL SCIENCES
(PAPER 1)**

**MARKING GUIDELINES**

**QUESTION 1**

| | | |
|---|---|---|
| 1.1 | D-- | (2) |
| 1.2 | C-- | (2) |
| 1.3 | B-- | (2) |
| 1.4 | D-- | (2) |
| 1.5 | C-- | (2) |
| 1.6 | A-- | (2) |
| 1.7 | D-- | (2) |
| 1.8 | B-- | (2) |
| 1.9 | B-- | (2) |
| 1.10 | D-- | (2) |

**[20]**

**QUESTION***2*

2.1 The rate of change of the acceleration -- (2)

2.2 2.2.1 Select right as + and left as -

Learner A:  =

= 8   60

= 4

= (        +    ) +         -

= (4 + 0.3)-+(−5) -

= −0.7

= 0.7  -     .- (5)

2.2.2 $F_{only}$= mom

$F_{perpendicular}$- $F_A$- $F_f$= mom     - $\Big\}$

0.7 = 0.12a -

$a = \dfrac{0.7}{0.12}$

a = 5.83 m·s$_{-2}$- (3)

2.2.3 Newton's Second Law - (1)

2.2.4    When the net force is exerted on an object with mass**m**, the object will accelerate in the direction of the net force. Acceleration is directly proportional to the net force and inversely proportional to the mass of the object --

(2)

2.2.5

| Accepted labels | |
| --- | --- |
| **w** | $F_g$/ $F_w$/ weight / mg / gravitational force |
| **F$_A$** | $F_T$/Applied force/ |
| **f** | $F_f$/ Friction |
| **A** | $F_A$/ Normal |
| **5 N** | $F_a$/ $F_{5N}$/ $F_{applied}$/ $F_t$/ F |



| Marking criteria | Marks |
| --- | --- |
| Correct direction and label of the normal force | 1 |
| Correct direction and label of    Fg/wl | 1 |
| Correct direction and label of horizontal component of the applied force by Learner A | 1 |
| Correct direction and label of friction force | 1 |
| Correct direction and label of the applied force by Learner B | 1 |

(5)

2.3.1 He will move backwards. - (1)

2.3.2    According to Newton's Third Law: When the boy pushes the wall, the wall simultaneously pushes a force back, but in the opposite direction. That's why he slips backwards.-- (2)

**[21]**

**QUESTION 3**

3.1  The total linear momentum of an isolated system remains constant (conserved) in magnitude and direction.-- (2)

3.2 $\Sigma p$front = $\Sigma p$after- $(m_1 + m_2)v$
$_i = m_1 f_{f1} + m_2 f_{f2}$
$(+ 2,000)(4) - = (1,000)v_{f1} + (2,000)(5,6) -$
$f_{f1} = 0.8$ ms$^{-1}$after lings- (4)

3.3 3.3.1 Impulse $= \Delta$ -
$= m(v_f - f_i)$
$= (2,000)(5.6 - 4) - =$
3,200 kgm s$^{-1}$- (3)

3.3.2 $F_{only}\Delta t = \Delta$  - $F_{only}(0,2) - =$
3,200-$F_{only}$= 16,000 N
- (4)

3.4 3.4.1 Lower - (1)

3.4.2  When the time of impact increases, the net force decreases.-- 

**OR**

Fnet is inversely proportional to time $F_{only} = \dfrac{-p}{-t}$ (2)

**[16]**

**QUESTION 4**

4.1  Total mechanical energy remains constant in an isolated system. -- (2)

4.2 $m_E$= EK + Ep - = ½ $mv^2$
+ mgh
= ½ (2.5)(0)$^2$+ (2.5)(9.8)(10) - = 0
+ 245-
= 245 J- (4)

4.3 4.3.1 No - (1)

4.3.2  The force applied and the direction of motion are perpendicular to each other, so no work is done on the object.-- (2)

**[9]**

**QUESTION 5**

5.1 Tension is the internal restoring force per unit area of a body. -- (2)

5.2 5.2.1 $\sigma - \dfrac{F}{A}$ -

$1.6 \times 10_9 = \dfrac{(5 \quad 9.8)}{}$ -

$A = 3.06 \times 10_{-8}m_2$- (3)

5.2.2 $\sigma - \dfrac{F}{A}$ -

$= \dfrac{(5 \quad 9.8)}{2(3.06 \quad 10_{-8})}$

$= 8.01 \times 10_8 Dad$- (2)

5.2.3 20 % or 15 = 3 cm -

$- - \dfrac{-L}{L}$ --

$= \dfrac{3}{15}$ -

$= 0.2$ or $2 \times 10_{-1}$ (4)

5.2.4 $K = \quad -$ -

$= \dfrac{8.01 \ .10_8}{0.2}$

$= 4 \times 10_9$- (2)

5.3 Strain or strain is the ratio of change in the specific dimension to the original dimension. -- (2)

5.4 5.4.1 Elastic limit - (1)

5.4.2 Between E and B - (1)

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

5.4.4 Between A and B - (1)

**[20]**

**QUESTION 6**

6.1     Viscosity is a physical property of liquids. It shows resistance to flow.--

(2)

6.2     5W-30 SAE is the oil that behaves like an SAE 5 oil at low temperatures, and behaves like an SAE 30 at high temperatures.-

**OR**

5: Viscosity grade at cold temperature, W: Winter 30: Viscosity at $100_{oh}C$     (2)

6.3 B-     (1)

6.4     In summer South Africa has high temperature, B has a<u>higher viscosity</u> -at<u>whore temperatures-</u>

(2)

6.5 Single / mono-grade oil is rated at one temperature -, while the multigrade oil is rated at two temperatures.-

   **OR**

   -   Single / Monograde oil is the engine oil designed to function at low temperatures or high temperatures and may not be suitable for changing engine temperatures. For example, SAE 40 oil is a monograde oil.
   -   Multigrade oil is an engine oil designed to handle the increasing engine temperatures. It acts as a low viscosity oil at lower temperatures and as a high viscosity oil at high temperatures. For example, 20W50 SAE is an engine oil that behaves as SAE 20 when the engine is cold and as SAE 50 when the engine warms up..

(2)
**[9]**

**QUESTION 7**

7.1 Hydraulics is a field in applied sciences and engineering-which deals with mechanical properties of fluids. -

**OR**

The studyof mechanical properties of fluids .(1 point if this definition is given.) (2)

7.2
- The design of hydraulic systems, steering systems, braking systems, power steering systems, etc-
- Presses: metal presses, wooden presses, ceramic presses, plastic presses, etc.
- Machinery for industries: metal, wood, textile, paper, etc-
- Processing machinery: wood processing machinery, sheet metal processing-
- Casting: Casting of molds with foam, glass, plastic etc.-
- Component finishes: circular tables, rotating distributors, clamping systems, etc.-

(Accept any TWO.) (2)

7.3 7.3.1 **Pascal's law**states that the pressure applied to any point in the continuous fluid at equilibrium will be distributed equally to the other part of the fluid. -- (2)

7.3.2 $P = \dfrac{}{}$

$1.2 \times 10^5 = \dfrac{}{8.4 \quad 10^{-3}-}$

$F = 1.0 \times 10^3 N$ or 1000 N or 1 kN- (3)

7.3.3 At right angles to the diver - (1)

7.4 The height of the water surface is 20 – 4 = 16 m-1 m from the bottom the height below the surface is 15 m $P = pgh$-

$= \underline{1000 \times 9.8} \text{ -x 15- } =$
$1.47 \times 10^5 Dad$- (4)

7.5 $\dfrac{}{} = \dfrac{-}{}$

$\dfrac{130}{0.002} = \dfrac{}{0.025}$ -

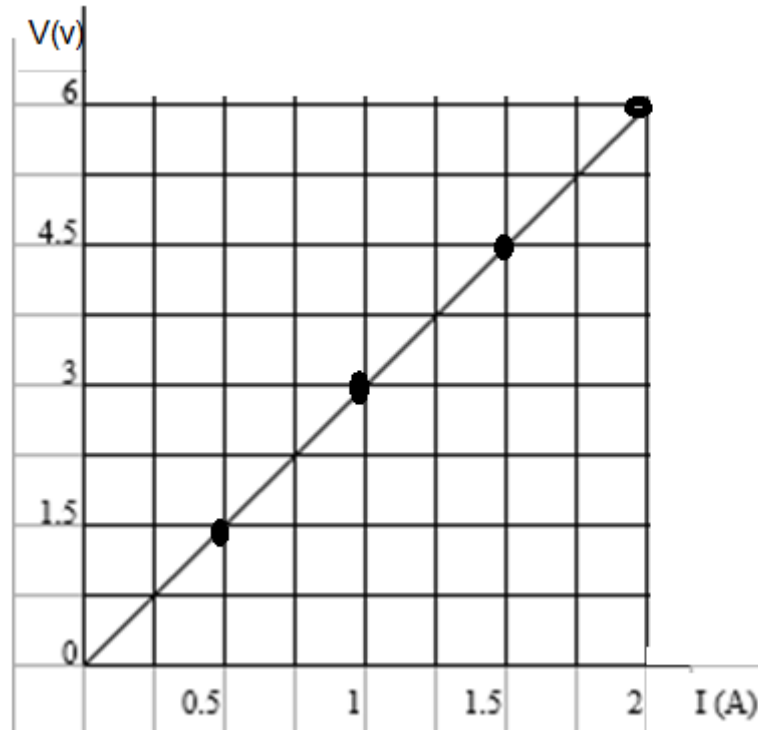$F_I = 1.625 \times 10^3 N$ or 1 625 N- (3)

**[17]**

**QUESTION 8**

8.1 <u>The potential difference</u> across a conductor is directly proportional to the<u>current</u> in the <u>conductor at constant temperature</u>-- (2)

8.2 Temperature - (1)

8.3 8.3.1 Graph on Potential Difference versus Current Strength



| Marking criteria | MARKS | |
|---|---|---|
| Heading | 1 | |
| x and y axis labeled | 1 | |
| Real scale on the x and y axis | 1 | |
| All points plotted correctly | 1 | (4) |

8.3.2 Resistance - (1)

8.3.3 $R = \dfrac{-}{-}$ or $= \dfrac{\Delta}{\Delta}$

$= \dfrac{1.5}{0.5}$ -

$= 3 \ \Omega$-

(Accept any two matching values from the chart.)

(3)

8.4 8.4.1 $W = I^2 Rt$-

$= 2^2 \times 3 \times 25$-

$= 300 \ J$- (3)

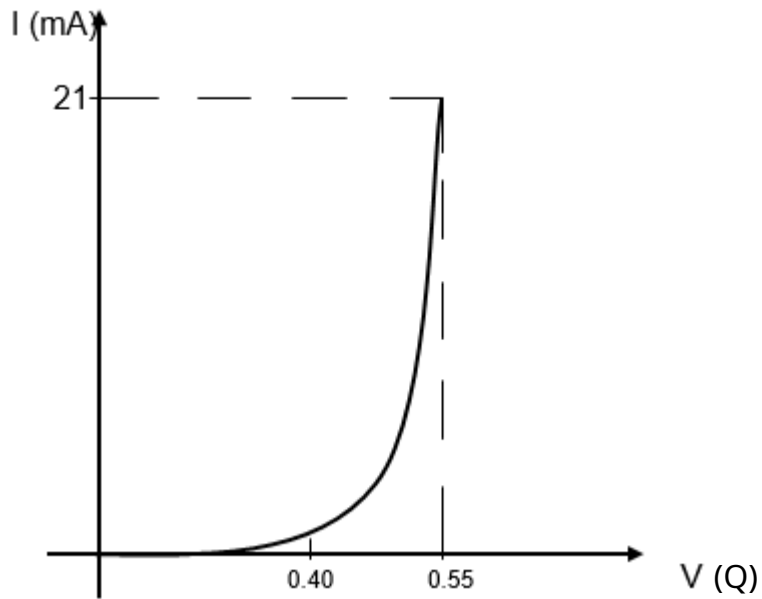8.4.2 Reduce / become less - (1)

**[15]**

**9**

**QUESTION 9**

9.1    Doping is the process of adding impurities to intrinsic semiconductors.--

(2)

9.2 9.2.1



(3)

| Marking criteria | Point |
|---|---|
| Correct shape of the graph | 1 |
| Corresponding coordinates (at least one) on graph (even if not written). Line of best fit | 1 |
| Correct axis with I in vertical axis and V on horizontal axis | 1 |

9.2.2    The voltage across the diode remains between 0.4 V and 0.55 V when it allows current to flow through it, regardless of the supply voltage.--

(2)

9.3 9.3.1    The amount of electrical charge that a capacitor can store on its two plates per volt--

(2)

9.3.2    This changes the pulsating DC voltage to a smooth DC voltage. -

(1)

9.3.3 Total area of   the plates - Distance between the two plates - Any type of dielectric material-(Any TWO)

(2)

9.3.4 C =    $\underline{0}$ -

$$= \frac{(8.84 \times 10^{-12})(0.01)}{0.0025}$$

=3.54x10$^{-11}$F-

(4)

**[16]**

**QUESTION 10**

10.1    A transformer is a device used to increase or decrease voltage. --

(2)

10.2    10.2.1    Transformer  A -                                            (1)

         10.2.2    Transformer  B -                                            (1)

10.3    $\_ = -$  __

$$\frac{}{240} = \frac{25}{330} -$$

Vs = 18.2 V-                                                                  (3)

**[7]**

**TOTAL:    150**