NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE/*GRAAD* 11

NOVEMBER 2019

TECHNICAL SCIENCES P2/*TEGNIESE WETENSKAPPE V2* MARKING GUIDELINE/*NASIENRIGLYN*

MARKS/*PUNTE*: 150

This marking guideline consists of 10 pages/
*Hierdie nasienriglyn bestaan uit 10 bladsye.*

QUESTION/*VRAAG* **1**

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

[20]

QUESTION/*VRAAG* **2**

2.1 A transverse wave is a wave in which the particles of the medium vibrate perpendicularly (at right angles) to the direction of the propagation of the wave. ✓✓
'n Transversale golf is 'n golf waar die partikels van die medium loodreg op die rigting van die voortplanting van die golf vibreer. ✓✓ (2)

2.2

Crest / *Kruin*

9 cm
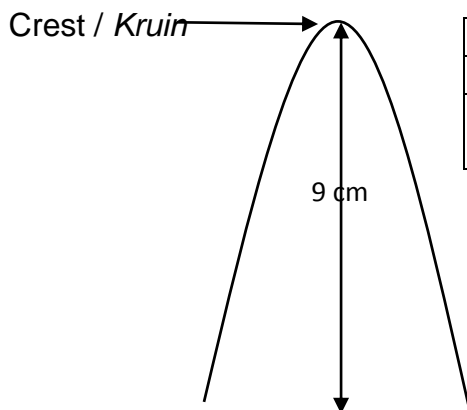
Criteria for marking / *Kriteria vir merk*	
Crest labelled / *Kruin getoon*	✓
Correct magnitude of amplitude *Korrekte grootte van amplitude*	✓

(2)

2.3 Superposition. ✓ The algebraic sum of the amplitude of the pulses that meet at the same point simultaneously. ✓✓
Superposisie. ✓ *Die algebraïesesom van die amplitude van die pulse wat gelyktydig ontmoet by dieselfde punt.* ✓✓
OR/*OF*
Constructive Interference. ✓ The superposition of the two pulses which are in phase. ✓✓
Konstruktiewe interferensie. ✓ *Die superposisie van die twee pulse wat in fase is.* ✓✓ (3)

2.4 In phase. ✓ The crest of one pulse meets the crest of another pulse. ✓✓
In fase. ✓ *Die kruin van een puls ontmoet die kruin van 'n ander puls.* ✓✓ (3)

2.5   2.5.1   The maximum displacement of a particle/wave from its rest (equilibrium) position. ✓✓
Die maksimum verplasing van 'n deeltjie/golf van sy rus- (ewewigs-) posisie. ✓✓   (2)

        2.5.2   3 cm ✓✓   (2)

        2.5.3   TO THE LEFT / *NA LINKS* ✓✓   (2)

        2.5.4   The amplitude of pulse **K** will remain 3 cm (same amplitude as before interference) ✓✓ and the direction of the pulse will be to the right ✓✓
*Die amplitude van puls **K** sal 3 cm bly (dieselfde amplitude as voor die interferensie)* ✓✓ *en die rigting van die puls sal na regs wees.* ✓✓   (4)

[20]

QUESTION/*VRAAG* 3

3.1 $\frac{0,6}{0,3}$ = 2 ✓✓ (complete waves/*volledige golwe*)   (2)

3.2   Q & S
        P & R   ✓✓
        U & W   (Any combination/*Enige kombinasie)*
        S & T   (2)

3.3   Q & U
        S & W   ✓✓
        P & T   (Any combination/*Enige kombinasie)*
        R & V   (2)

3.4   5 x 0,3 ✓ = 1,5 s ✓

        OR/*OF*

        (0,3+0,3+0,3+0,3+0,3) ✓ = 1,5 s ✓   (2)

3.5   3.5.1   Q-crest/*kruin* ✓
                  S-trough/*trog* ✓   (2)

        3.5.2   Rest position ✓ **OR** Equilibrium ✓
                  Rusposisie ✓ **OF** *Ewewigsposisie* ✓   (1)

3.6   3.6.1 $\frac{6}{2}$ ✓ = 3 cm ✓   (2)

        3.6.2 $\frac{12}{2}$ ✓ = 6 cm ✓   (2)

3.7   f=$\frac{1}{T}$ ✓ = $\frac{1}{0,3}$ ✓ = 3,33 Hz
        but/*maar* v = fλ ✓
                = 3,33 x 0,06
                = 0,1998 m•s⁻¹ (0,2 $m \bullet s$⁻¹) ✓
        OR/*OF*
        v =$\frac{\lambda}{T}$ ✓ = $\frac{0,06✓}{0,3✓}$ = 0,2 $m \bullet s$⁻¹ ✓
                                                                                                        (4)
                                                                                                     [19]

QUESTION/*VRAAG* 4

4.1 Sound waves are defined to be longitudinal since the motion of the wave is parallel to the direction of propagation in the medium. ✓✓
Klankgolwe word as longitudinaal gedefinieer aangesien die beweging van die golf parallel is aan die rigting van voortplanting in die medium. ✓✓ (2)

4.2 4.2.1 N or P or R or T✓ (Any ONE / *Enige EEN)* (1)

4.2.2 NP or PR or MO or QS✓
(Any 1 combination / *Enige een kombinasie*) (1)

4.2.3 M O Q S✓ (Any ONE / *Enige EEN)* (1)

4.3 It is the time taken to complete one vibration/cycle of a wave. ✓✓
Dit is die tyd wat dit neem om een volledige vibrasie/siklus van 'n golf te voltooi. ✓✓ (2)

4.4 4.4.1 $T = \frac{1}{f} = \frac{1}{500}$✓ $= 0,002s$✓ (2)

4.4.2 $\lambda = \frac{\Delta x}{2} = \frac{1,36}{2}$✓ $= 0,68 \, m$✓ (2)

4.4.3 $v = f\lambda = 500 \times 0,68$✓ $= 340 \, m \cdot s^{-1}$✓

OR/*OF*

$v = \frac{\lambda}{T} = \frac{0,68}{0,002}$✓ $= 340 \, m \cdot s^{-1}$✓ (2)

4.5 It was travelling in **air** ✓✓(since the speed of sound in air is $340 \, m \cdot s^{-1}$.)
*Dit beweeg in **lug*** ✓✓ (*aangesien die spoed van klank in lug* $340 \, m \cdot s^{-1}$ *is*) (2)

4.6 4.6.1 $v = \frac{\lambda}{T} \rightarrow \lambda_A = vT = 330 \times 1,5$✓$= 495 \, m$✓ (2)

4.6.2 $\lambda_B = vT = 330 \times 2$✓ $= 660 \, m$✓ but $\Delta x = \lambda_B - \lambda_A = 660 - 495 = 165 \, m$✓ (3)

4.6.3 The reason that the echo is weaker than the original sound is because sound waves impart energy to the surface from which it bounces. ✓✓
Die rede waarom die eggo swakker is as die oorspronklike klank is dat die klank energie verloor wanneer dit van die oppervlakte terugbons. ✓✓

OR

When a sound wave is directed at a distant surface, particles of air in the path transmit energy to the next particle until it reaches the surface ✓✓
Wanneer die klankgolf gerig word na 'n verafgeleë oppervlakte, word energie oorgedra van die deeltjies in die pad van die klank na die volgende deeltjie totdat die klank die oppervlakte bereik. ✓✓ (2)

4.7 An echo refers to sound that is repeated because the sound waves are reflected back✓✓.
'n Eggo verwys na die klank wat herhaal word want die klankgolwe word terug weerkaats. ✓✓ (2)

4.8.1
- Automatic door openers / *Om outomatiese deure oop te maak* ✓
- To measure the rate of blood flow / *Om die tempo van bloedvloei te meet* ✓
- To monitor/examine the heartbeat of a foetus/ *Om die hartklop van 'n fetus te monitor/ondersoek.* ✓
- To detect invisible defects in materials/ *Om onsigbare defekte in materiaal op te spoor* ✓

(Any THREE/*Enige DRIE*) (3)

4.8.2
- It is used in anti-poaching strategies/*Word in teen-wildstropery gebruik* ✓
- It is used to detect natural disasters/*Om natuurrampe vroegtydig te voorspel* ✓
- It is used to enforce compliance of nuclear test ban/*Word gebruik om die nakoming van kerntoetsverbodverdrae af te dwing.* ✓

(Any TWO/*Enige TWEE*) (2)

[29]

QUESTION/*VRAAG* **5**

5.1 The starter must wear ear muffs*.* ✓
The gun should be pointed upwards with the arm stretched above the head. ✓
Die afsitter moet oormowwe gebruik. ✓
Die geweer moet opwaarts gemik word met 'n uitgestrekte arm bokant die kop. ✓ (2)

5.2 To have a fair test/*Sodat die toets regverdig is* ✓

OR/*OF*

To maintain the accuracy of the results/*Om die resultate akkuraat te hou.* ✓ (1)

5.3
.
$$v = \frac{\lambda}{T} = \frac{200✓}{0,6✓} = 333,33 \; m \bullet s^{-1}✓$$ (3)

5.4 No. ✓ If the distance between the learners doubles, then the time will also double ✓ hence the answer will not change. The speed will remain the same. ✓
Nee. Indien die afstand tussen die leerders verdubbel word, sal die tyd ook verdubbel en dus sal die antwoord nie verander nie. Die spoed sal dieselfde bly. ✓ (3)
[9]

QUESTION/*VRAAG* 6

6.1   A substance that absorbs energy (heat) from the heat source
       'n Stof wat energie absorbeer (hitte) van 'n bron van hitte. ✓✓   (2)

6.2   Heat (petrol or diesel) engine, refrigerator, coolant, electric drill, lawn
       mower, hair dryer.   (Any TWO) ✓✓
       Hitte (petrol of diesel) enjin, yskas, verkoeler, elektriese boor, grassnyer,
       haardroër.   *(Enige TWEE)* ✓✓   (2)

6.3   The amount of heat lost equals the amount of heat gained when no heat is
       lost ✓✓
       Die hoeveelheid warmte wat afgegee word is gelyk aan die, = hoeveelheid
       hitte opgeneem, mits geen energie verlore gaan nie. ✓✓   (2)
       [6]

QUESTION/*VRAAG* **7**

7.1 A thermal closed system is a system that can exchange energy (as heat or work) but not matter with its surroundings, ✓✓ while an isolated system cannot exchange any heat, work or matter with the surroundings. ✓✓
'n Termies geslote sisteem is 'n sisteem wat energie (as hitte of werk) aan of van die omgewing ontvang, maar geen materie nie, ✓✓ terwyl 'n geïsoleerde sisteem nie deur sy omgewing beïnvloed word nie en geen wisselwerking van hitte, energie of werk vind met die omgewing plaas nie. ✓✓ (4)

7.2 Water. ✓
It has a higher specific heat capacity compared to ethanol/
Dit het 'n hoër spesifieke warmtekapasiteit in vergelyking met etanol. ✓ (2)

7.3 $\Delta Q = \Delta U + \Delta W$ ✓
1500 = ΔU + 2200 ✓
ΔU = - 700 J ✓
OR/*OF*
Since the system loses more energy in <u>doing work</u> ✓ than it gains in the form of <u>heat</u>✓, hence the internal energy of the system decreases to -700 J ✓
Aangesien die sisteem meer energie verloor terwyl <u>werk verrig word</u> ✓ as wat dit bykry in die vorm van <u>hitte</u>, ✓ is die interne energie van die sisteem verminder tot -700 J. ✓ (3)

7.4   Q lost by 100 g water = Q gained unknown mass of water
           Q verloor deur 100 g water = Q bygekry deur onbekende massa water

$(mc_{water}\Delta T)_{lost\ by\ 100\ g\ of\ water} = (mc_{water}\Delta T)_{gain\ of\ unknown\ mass\ of\ water}$
$(mc_{water}\Delta T)_{verloor\ deur\ 100\ g\ water} = (mc_{water}\Delta T)_{bygekry\ deur\ onbekende\ massa\ water}$✓

0,1(4200) 55✓   = m (4200) 15✓
m = 0,3667 kg✓ or 366,67 g (4)

7.5 The entire system of iron and water together is isolated.
Die hele sisteem van yster en water wat saam geïsoleerd is.

$\Delta Q_{system} = 0$✓ $= \Delta Q_{water} + \Delta Q_{Fe}$
$0 = m_{water}c_{water}\Delta T_{water} + m_{Fe}c_{Fe}\Delta T_{Fe}$✓
  = 0,500•4200•5 ✓+ 0,100•c_{Fe}•(-203) ✓
  20,3c_{Fe} = 10500✓ so c_{Fe} = 517,24 J•K^{-1}•kg^{-1}✓ (6)

[19]

QUESTION/*VRAAG* 8

8.1   A cation is a positively charged ioon ✓✓ while an anion is a negatively charged ion. ✓✓
'n Katioon is 'n positiefgelaaide ioon ✓✓ terwyl 'n anioon 'n negatiefgelaaide ion is. ✓✓   (4)

8.2   8.2.1 $2K + (-2) = 0$
$2K = 2$
$K = +1$ oxidation number/*oksidasiegetal*   (2)

8.2 .2 $1 + Mn + 4(-2) = 0$
$1 + Mn - 8 = 0$
$Mn = +7$ oxidation number/*oksidasiegetal*   (2)

8.3   8.3.1 Mg ✓ $\rightarrow Mg^{2+} + 2e^-$ ✓ oxidation/*oksidasie*   (2)

8.3.2 O_2 ✓ $+ 2e^- \rightarrow 2O^{2-}$ ✓ reduction/*reduksie*   (2)

8.4   8.4.1   It is a chemical decomposition produced by passing an electric current through a liquid or solution containing ions. ✓✓
Dit is 'n chemiese ontbinding wat geproduseer word deur 'n elektriese stroom deur 'n vloeistof of 'n oplossing wat ione bevat, te laat vloei. ✓✓   (2)

8.4.2   They are non-reactive/*Hulle is nie-reaktief.* ✓✓
OR/*OF*
They are inert / *Hulle is inert* ✓✓.   (2)

8.4.3   Electrode/*Elektrode* **A**
Copper will be deposited on the electrode/*Daar is 'n neerslag van koper op die elektrode.*
OR/*OF*
Metallic brown deposit/*Metaalbruin neerslag wod gevorm* ✓✓.
Electrode/*Elektrode* **B**
Bubbles are formed around the electrode/*Borrels vorm om die elektrode* ✓✓   (4)

8.5   8.5.1   B✓   (1)

8.5.2   A✓   (1)

8.6   8.6.1 $Cu^{2+} + 2e^-$ ✓ $\rightarrow Cu$✓   (2)

8.6.2 $2Cl^-$ ✓ $\rightarrow Cl_2 + 2e^-$ ✓   (2)

8.7   • Preparation of chemicals/*Bereiding van chemikalieë* ✓
• Electroplating/*Elektroplatering* ✓
(ANY TWO/*ENIGE TWEE)*
Purification/extraction of metals/*Suiwering/ekstraksie van metale*   (2)
[28]

TOTAL/*TOTAAL*:   150