education

Department of Education
FREE STATE PROVINCE

JUNE EXAMINATION/*JUNIE EKSAMEN*

GRADE/*GRAAD* 10

PHYSICAL SCIENCES
FISIESE WETENSKAPPE

MEMORANDUM

JUNE/*JUNIE* 2024

MARKS/*PUNTE*: 150

TIME: 3 HOURS
TYD: 3 URE

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This marking guideline consists of 9 pages.

Hierdie nasienriglyn bestaan uit 9 bladsye.

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QUESTION 1/*VRAAG 1*

1.1 A ✓✓

1.2 B ✓✓

1.3 C ✓✓

1.4 A ✓✓

1.5 D ✓✓

1.6 D✓✓

1.7 B ✓✓

1.8 C✓✓

1.9 B ✓✓

1.10 C ✓✓



[10 × 2] = 20

QUESTION 2/*VRAAG 2*

2.1 A single disturbance that moves in a medium from one point to another ✓✓/ *'n Enkele versteuring wat deur 'n medium van een punt na die volgende beweeg* (2)

2.2.1 4 cm ✓ (1)

2.2.2 7 cm ✓ (1)

2.3



Marking criteria/ Nasienriglyn	
✓	Shape / *vorm*
✓	Pulse length / *puls-lengte* = 4 cm
✓	Amplitude = 3 cm

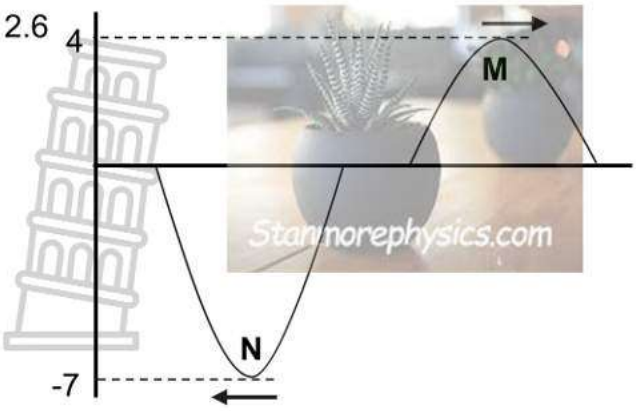
(3)

2.4 Superposition / *Superposisie*.✓ (1)

2.5 Destructive (interference) / *Destruktiewe (interferensie)*.✓ (1)

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2.6



Marking criteria / *Merkkriteria*	
✓	Both shapes correct/ *Beide vorms korrek*
✓	Both directions correct/ *Beide rigtings korrek*
✓	Amplitude of M correct/ *Amplitude van M korrek*
✓	Amplitude of N correct/ *Amplitude van N korrek*

(4)
[13]

QUESTION 3 / *VRAAG 3*

3.1.1 Diagram **3**.✓ <u>High frequency</u> for the same amplitude.✓/ <u>*Hoër frekwensie vir dieselfde amplitude*</u> (2)

3.1.2 Diagram **2**.✓<u>Large amplitude</u> for the same frequency.✓/ <u>*Groter amplitude vir dieselfde frekwensie*</u> (2)

3.2 **OPTION 1/*OPSIE 1***

Time for building **X**
Tyd vir gebou 1

$t = \frac{1}{2}(2)$ ✓
$= 1$ s

*D*istance (*afstand*) = speed/(*spoed*)×time(*tyd*)
$= 330(1)$ ✓
$= 330$ m

Time for building **Y**
Tyd vir gebou 2

$t = \frac{1}{2}(3)$ ✓
$= 1{,}5$ s

distance (*afstand*)= speed/(*spoed*)×time(*tyd*)
$= 330(1{,}5)$✓
$= 330$ m $= 495$ m

distance between the two buildings = 330 ✓+ 495
afstand tussen twee geboue = 825 m✓

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OPTION 2

Time (man-building X-man) = 2 s
distance=speed×time / *afstand = spoed x afstand*
= 330(2)✓
$= 660\ m$
Time (man-building Y-man) = 3 s
= 330(3)✓
$= 990\ \text{m}$
Distance from man to building X/*afstand van man na gebou X*

$= \frac{1}{2}(660)$ ✓
= 330 m
$= \frac{1}{2}(990)$ ✓
= 495 m
distance between the two buildings/*afstand tussen twee geboue*
= 330 + 495 ✓
= 825 m✓

(6)
[10]

QUESTION 4 / *VRAAG 4*

4.1 **Any 2 / *Enige 2***

- All EM waves travel at the same speed. ✓ / *Alle EM golwe beweeg teen dieselfde spoed*
- All EM waves can propagate in a vacuum. ✓/ *Alle EM golwe kan deur 'n vakuum voortgeplant word.*
- All EM waves possess particle and wave properties. / *Alle EM golwe het deeltjie- en golfgeaardheid* (2)

4.2.1 Radio (waves) ✓ / *Radio (golwe)* (1)

4.2.2 Infrared ✓/ *Infrarooi* (1)

4.2.3 Gamma rays ✓/ *Gammastrale* (1)

4.2.4 Visible light✓/ *sigbarelig* (1)

4.3 **Any 2 / Enige 2**

- Originate from accelerating electric charges.✓/ *Die bron van EM straling is die versnelling van elektriese lading.*
- They propagate by varying electric fields and magnetic fields,

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such that these two fields are at right angles to each other and at a right angle with the direction of propagation of the wave.✓ / *Hulle beweeg vorentoe as gevolg van elektriese- en magnetiese velde wat reghoekig tot mekaar ossilleer en wat reghoekig tot die bewegingsrigting van die golf ossilleer.*

- Electromagnetic waves travel in vacuum./ *Elektromagnetiese golwe beweeg deur 'n vakuum.*
- The speed of the waves is 3 x 10^8 m·s^{-1}. / *Die spoed van die golwe is 3 x 10^8 m·s^{-1}.* (2)

4.4.1 Ultraviolet ✓

Ultraviolet	Infrared / *Infrarooi*
$f = \frac{c}{\lambda}$ ✓ $= \frac{3 \times 10^8}{5 \times 10^{-8}}$ ✓ $= 6 \times 10^{15}$ Hz	$f = \frac{c}{\lambda}$ $= \frac{3 \times 10^8}{5 \times 10^{-4}}$ ✓ $= 6 \times 10^{11}$ Hz
$f_{ultraviolet} > f_{infrared} / f_{infrarooi}$	

(4)

4.4.2 Ultraviolet✓ the higher the frequency the higher the penetrating ability.✓
Hoe hoër die frekwensie, hoe hoër die penetreervermoë. (2)

4.5 Packet of energy found in light.✓✓ / *Pakkie energie wat in lig aangetref word.* (2)

4.6
$$E = h\frac{c}{\lambda} \checkmark$$
$$= \frac{6{,}63 \times 10^{-34}(3 \times 10^8) \checkmark}{5 \times 10^{-13} \checkmark}$$
$$= 3{,}98 \times 10^{-13} \text{ J} \checkmark$$

(4)
[20]

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QUESTION 5 / *VRAAG 5*

5.1.1 The net charge of an isolated system remains constant during any physical process. ✓✓ *Die netto lading van 'n geïssoleerde sisteem bly konstant gedurende enige fisiese proses.* (2)

5.1.2 Positive.✓ As the rod came near, the electrons in the disc will be repelled down the shaft ✓ like charges repel ✓leaving the disc positively charged./ Positief. *Soos wat die politeenstaaf naby aan die skyf kom word elektrone afgestoot aangesien gelyksoortige ladings mekaar afstoot. Die elektrone beweeg met die skag van die elektroskoop af wat veroorsaak dat die skyf positief gelaai is.* (3)

5.1.3 The electrons on the shaft and gold leaf will repel,✓ like charges repel.✓/

Die elektrone in die skag stoot die elektrone in die goudblaar af. Gelyksoortige ladings stoot mekaar af. (2)

5.2.1 C ✓ (1)

5.2.2
$$Q = \frac{Q_1 + Q_2}{2} \checkmark$$
$$= \frac{2 \times 10^{-6} + (-8 \times 10^{-6})}{2} \checkmark$$
$$= -3 \times 10^{-6}\ C \checkmark$$
(3)
[11]

QUESTION 6 / *VRAAG 6*

6.1 Work done by the source per unit charge. ✓✓/ *Die arbeid verrig per eenheidslading deur die bron.* (2)

6.2 **OPTION 1**

$V_{10\Omega} = I_{10\Omega} R_{10\Omega}$ ✓
$= 0{,}9(10)$ ✓
$= 9\ V$ ✓

OPTION 2

$V_{10\Omega} = V_{30\Omega}$
$= IR$ ✓
$= (0{,}3)(30)$ ✓
$= 9\ V$ ✓
(3)

6.3.1 **POSITIVE MARKING FROM QUESTION 6.2/ *POSITIEF NASIEN VANAF VRAAG 6.2***

$V_T = V_p + V_s$
$15 = 9 + V_s$ ✓
$V_R = 6V$ ✓ (2)

6.3.2
$V_{10\Omega} = I_{10\Omega} R_{10\Omega}$
$9 = I_{10\Omega}(10)$ ✓
$I_{10\Omega} = 0{,}9\ A$
Total current / *Totale stroom* $= 0{,}9 + 0{,}3$ ✓
$= 1{,}2\ A$ ✓ (3)

6.3.3
$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} \checkmark$$
$$= \frac{1}{30} + \frac{1}{10} \checkmark$$
$$R_p = 7{,}5\ \Omega \checkmark$$
(3)

6.3.4 **POSITIVE MARKING FROM QUESTION 6.3.1 and 6.3.2/ *POSITIEF NASIEN VANAF VRAAG 6.3.1 en 6.3.2***

$R = \frac{V}{I}$
$= \frac{6}{1{,}2} \checkmark$
$= 5\ \Omega$
$R_{total/totaal} = 5 + 7{,}5$ ✓

OPTION 2

$R = \frac{V}{I}$
$= \frac{15}{1{,}2}$ ✓ ✓
$= 12{,}5\ \Omega$ ✓

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= 12,5 ✓ (3)

6.4 **POSITIVE MARKING FROM QUESTION 6.3.2/ *POSITIEF NASIEN VANAF VRAAG 6.3.2***

Q = I∆t✓
= 1,2✓(5x60)✓
= 320 C✓ (4)
[20]

QUESTION 7 / *VRAAG 7*

7.1 Temperature is increasing with increasing time.✓/ *Soos wat die tyd toeneem neem die temperatuur toe.* (1)

7.2.1 AB ✓ (1)

7.2.2 EF ✓ (1)

7.2.3 BC ✓ (1)

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7.3 Distance between particle: Closely packed ✓in an orderly arrangement
Motion: the particles vibrate only in their fixed positions ✓/
Aftand tussen die deeltjies: Deeltjies is baie na aan mekaar gepak in 'n baie reëlmatige, ordelike rangskikking
Beweging: Die deeltjies vibreer in hul vaste posisies (2)

7.4 Phase change.✓/ *Faseverandering* (1)

7.5 100 (°C) ✓ (1)
[8]

QUESTION 8 / *VRAAG 8*

8.1 The mean distance from the nucleus to the border of the outer orbital. ✓✓/ *Die gemiddelde afstand vanaf die kern na die grens van die buitenste orbitaal.* (2)

8.2 Atomic radius decrease.✓The number of electrons increases from left to right ✓the electrons on the outer shell will be pulled towards the centre due to attraction force the nuclear radius shrinks.✓/ *Die atoomradius neem af. Die aantal elektrone neem toe van links na regs. Die elektrone in die buitenste orbitaal sal sterker na die middel, na die nukleus toe, aangetrek word vanweë die aantrekkingskrag van die nukleus en daarom neem die radius af.* (3)

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8.3.1 19 ✓ (1)

8.3.2 20 ✓ (1)

8.3.3 10✓ (1)

8.3.4 14 ✓ (1)

8.4.1 78,7 (%) ✓ (1)

8.4.2 ^{24}Mg✓ It has a high percentage.✓/ *Dit het die hoogste natuurlike voorkoms persentasie.* (2)

8.4.3 **POSITIVE MARKING FROM QUESTION 8.4.1 /*POSITIEWE NASIEN VANAF VRAAG 8.4.1***

$$A_r = \frac{(78{,}7 \times 24)\checkmark + (10{,}13 \times 25) + (11{,}17 \times 26)\ \checkmark}{(78{,}7 + 10{,}13 + 11{,}17)\ \checkmark \text{OR/}OF\ 100}$$
$$= 24{,}32\ \checkmark$$ (4)

8.5 $1s^2$ ✓$2s^2\ 2p^6$ ✓ (2)
[18]

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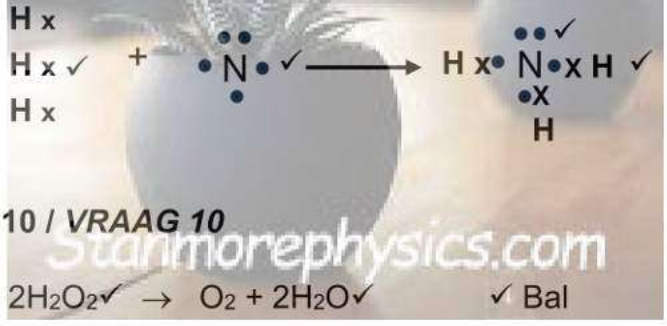
QUESTION 9 / *VRAAG 9*

9.1.1 A mutual attraction between two atoms resulting from the simultaneous attraction between their nuclei and the outer electrons.✓✓/ *'n Wedersydse aantrekking tussen twee atome wat die gevolg is van die gelyktydige aantrekking tussen hulle kerne en die buitenste elektrone.* (2)

9.1.2 Hydrogen chloride ✓(Hydrochloric acid = 0) /
Waterstofchloried (Soutsuur = 0) (1)

9.1.3 Covalent (bond) ✓ non-metal react with non-metal.✓/
Kovalente (binding) nie-metaal reageer met 'n nie-mataal (2)

9.2.1



(4)
[9]

QUESTION 10 / *VRAAG 10*

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10.1.1 $2H_2O_2$✓ → $O_2 + 2H_2O$✓ ✓ Bal

Marking criteria / *Merkkriteria:*
- Reactants/ *Reagense*✓ product/*produkte*✓ balancing/*balanseer* ✓ (3)

10.1.2 Decomposition.✓ Single compound breaks into two or more simple substances.✓/
Ontbindingsreaksie/ *Enkele verbinding breek op om twee of meer eenvoudiger stowwe te lewer.* (2)

10.1.3 Chemical change✓ original substance is broken down to form new substances.✓/ *Chemiese verandering die oorspronklike stof word afgebreek word om nuwe stowwe te vorm. Atome herrangskik tydens 'n chemiese reaksie om nuwe stowwe te vorm.* (2)

10.1.4

Any 1 ✓

M(reactants/*reagense*) = 2[(2x1) + (2 x 16)] ✓
= 68 g·mol^{-1}

M(product/*produkte*) = [(2 x 16)] + 2[(2x1) + 16]✓
= 68 g·mol^{-1}

M(reactants/*reagense*) = M(product/*produkte*) ✓ (4)



10.2.1

$$n(NaOH) = \frac{m}{M} \checkmark$$
$$= \frac{10}{40} \checkmark$$
$$= 0{,}25 \text{ mol} \checkmark$$

(4)

10.2.2 **POSITIVE MARKING FROM QUESTION 9.2.1 / POSITIEF NASIEN VANAF VRAAG 9.2.1**

$n[Cu(OH)_2] = ½\ n(NaOH)$✓
$= ½\ (0{,}25)$
$= 0{,}125$ mol✓

$n = \frac{m}{M}$ ✓

$0{,}125 = \frac{m}{97{,}5}$ ✓

$m = 12{,}19$ g ✓

(5)

10.2.3 Na_2SO_4 ✓ (1)

[21]

GRAND TOTAL/GROOTTOTAAL: 150

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