Education and Sport Development

Department of Education and Sport Development
Departement van Onderwys en Sportontwikkeling
Lefapha la Thuto le Tlhabololo ya Metshameko
NORTH WEST PROVINCE

NATIONAL SENIOR CERTIFICATE
NATIONALE SENOIR SERTIFIKAAT

GRADE/GRAAD 12

TECHNICAL SCIENCES P2/
TEGNIESE WETENSKAPPE V2

SEPTEMBER 2019

MARKING GUIDELINES/NASIENRIGLYNE

MARKS/PUNTE: 150

This memorandum consists of 11 pages./
Hierdie memorandum betaan uit 11 bladsye.

QUESTION /*VRAAG 1*

1.1 C✓✓ (2)

1.2 C✓✓ (2)

1.3 B✓✓ (2)

1.4 D✓✓ (2)

1.5 D✓✓ (2)

1.6 A✓✓ (2)

1.7 C✓✓ (2)

1.8 B✓✓ (2)

1.9 D✓✓ (2)

1.10 A✓✓ (2)
[20]

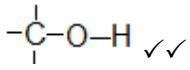
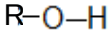
QUESTION/*VRAAG 2*

2.1

2.1.1 A series of organic compounds that can be described by the same general formula and where each member differs from the next by a ï CH_2 ✓✓ (2)
'n Reeks verbindings wat dieselfde algemene formule het maar elke lid verskil van die volgende met –CH_2.

2.1.2 Organic compound that consists of hydrogen and carbon atoms only. ✓✓ (2)
Organiese verbinding wat slegs uit koolstof en waterstof atome alleen bestaan.

2.2

2.2.1  ✓✓ **OR/ OF**  (2)

Note: Penelise one mark if  OH

2.2.2 C_5H_{10} ✓ (1)

2.2.3 2ï methyl✓ butanï 1ï ol ✓/2ï methyl✓ ï 1ï butanol ✓
2– metiel✓ butan–1–ol ✓/2– metiel✓ –1–butanol ✓ (2)

Marking criteria/ *Merk riglyne*
• 1 mark for 2- methyl and 1 mark for butanï 1ï ol /✓ *1 punt vir 2- metiel en 1 punt vir butan–1–ol*
Penalise if hyphen is not used.
Penaliseer *as koppelteken nie gebruik is nie.*

2.2.4 A ✓ (1)

2.2.5 Alkene ✓
Alkeen (1)

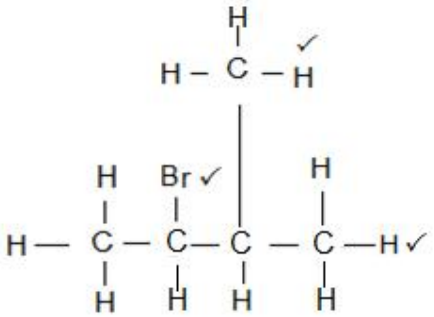
2.3.1 Organic molecules with the same molecular formula but with different structural formula. ✓✓ (2)
Organiese molekules met dieselfde molekulêre formules, maar verskillende struktuur formule.

2.3.2 Functional (isomers) ✓ (1)
Funksionele (isomere)

2.3.3 Carbonyl (group)✓
Karboniel
(1)

2.3.4 $C_nH_{2n}O$ ✓ (1)

2.4



Marking criteria/ *Merk riglyne*
- Correct position of methyl.✓
  Korrekte posisie van die metiel
- Correct position of bromine.✓
  Korrekte posisie van die broom.
- Whole structure correct ✓
  Die hele struktuur is korrek

NOTE: Any hydrogen/ hyphen missing **penalise 1 mark.**
LET WEL**:Enige 'H' of '-' wat uiteglaat is, **penaliseer 1 punt (3)

[19]

QUESTION /*VRAAG 3*

3.1 The temperature of a substance where vapour pressure equals to the atmospheric pressure. ✓✓ (2)
Die temperatuur waarby die dampdruk van die stof gelyk is aan die atmosferiese druk van die stof.

3.2.1 Hydrogen bond ✓ (1)
Waterstof binding

3.2.2 London forces/ induced dipole/dispersion ✓ (1)
Londenkragte/geinduseerder dipool /dispersie

3.3 Gas✓ (1)

3.4
- Propene (**D**) contains weaker✓ induceďï dipole forces/ dispersion/London forces✓while propanoic acid (**A**) contains stronger hydrogen bonds.
- More energy is needed to overcome the stronger hydrogen bonds/ intermolecular forces in propanoic acid (**A**) than in propene (**D**). ✓

OR
- Propanoic acid (**A**) contains stronger✓ hydrogen bonds ✓while propene (**D**) contains weaker inducedï dipole forces/ dispersion/London forces. ✓
- Less energy is needed to overcome the weaker London forces/ intermolecular forces in propene than in propanoic acid.
- *Propeen(**D**) bestaan uit swak ✓geinduseerde dipool kragte/ dispersie/londenkragte ✓ terwyl propanoësuur uit **(A)** sterk waterstof bindings bestaan.*
- *Meer energie word benodig om die sterk waterstof bindings te breek in propanoësuur**(A)** as in propeen **(D).***

OF
- *Propanoësuur **(A)** bestaan uit sterk ✓ waterstof bindings ✓* terwyl *propeen **(D)** bestaan uit swak geinduseerde dipool kragte/dispersie /londenkragte.✓*
- *Minder energie word benodig om die swak londenkragte in propeen te breek. ✓*

(3)

3.5 Propene/D✓ (1)
Propeen/D

3.6 The lower the boiling point the higher the vapour pressure. ✓✓ (2)
Hoe laer die kookpunt hoe hoër is die dampdruk.

OR/OF
The weaker the intermolecular forces the higher the vapour pressure.
Hoe swaker die intermolekulêre kragte hoe hoër die dampdruk.

3.7 The boiling point increases from propene (**D**) to propanoic acid **(A)**. ✓
The strength of the intermolecular forces increases from propene (**D**) to propanoic acid (**A**). ✓ (2)
Die kookpunt verhoog van propeen (**D**) *na propanoësuur.* **(A)**✓
Die intermolekulêre kragte versterk van propeen (**D**) *na propanoësuur* (**A**). ✓

OR/OF
The boiling point decreases from propanoic acid (**A**) to propene (**D**.
The strength of the intermolecular forces decreases from propanoic acid (**A**) to propene (**D**.
Die kookpunt verlaag van propanoësuur (**A**) *na propeen* (**D**).
Die intermolekulêre kragte verswak van propanoësuur (**A**) *na propeen* (**D**).

[13]

QUESTION /VRAAG 4

4.1

4.1.1 Hydrohalogenation ✓ (1)
Hidrohalogenasie

4.1.2 Hydrogenation ✓ (1)
Hidrogenasie

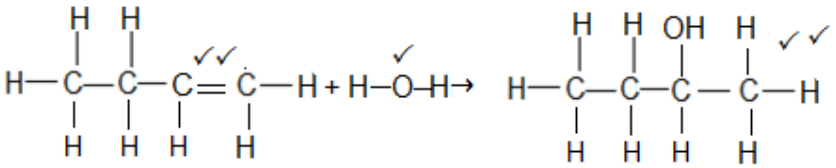
4.1.3 Hydration ✓ (1)
Hidrasie

4.2 $2C_4H_{10} + 13O_2$✓ Ÿ $8CO_2 + 10H_2O$ ✓ **balancing**✓/***balansering.*** (3)

Marking criteria/ *Merk riglyne*
- Correct reactants ✓
  Korrekte reagense
- Correct products✓
  Korrekte produkte

Correct balanced equation.✓
Korrek gebalanseer

4.3



(5)

Marking criteria/ Merk riglyne
- Structural formula of alkene correct.✓✓
  Struktuur formule van alkeen is korrek
- Structural formula of H_2O.✓(Do not penalise if H_2O used.)
  Struktuur formule van H_2O.✓(Moenie penaliseer as H_2O gebruik is nie.)
- Structural formula of product correct.✓✓
  Struktuur formule van produk is korrek.

NOTE: Any hydrogen missing or bond missing, **penalise 1 mark**
LET WEL:*Enige H of binding nie gewys,* ***penaliseer 1 punt***

4.4

4.4.1 synthetic materials derived from organic compounds. ✓✓ (2)
Sintetiese materiaal afgelei van organise verbindings.

4.4.2 Polythene ✓ (1)
Poliëtileen

[14]

QUESTION/ VRAAG 5

5.1 Is a process that uses electrical current to reduce dissolved metal cations so that they form coating on an electrode. ✓✓ (2)
Is 'n proses wat gebruik maak van elektriese stroom om opgeloste metaalkatione te reduseer sodat hulle in 'n dun metaallagie op 'n elektrode neergelê word.

OR/*OF*

The process of plating one metal onto another by electrolysis.
Die proses waar een metaal met 'n ander bedek word deur elektrolise.

5.2 Electrical (energy) to chemical (energy). ✓✓ (2)
Elektriese (energie) na chemiese (energie).

5.3 Non spontaneous ✓ (1)
Nie-spontaan

5.4 Energy is required for the reaction to take place.✓✓ (2)
Energie word benodig vir die reaksie om plaas te vind.

OR/*OF*

Reaction should be driven by a source of energy.
Die reaksie moet gedryf word deur 'n energie bron.

5.5 Ag^+ /Silver ions✓ (1)
Ag^+ /Silwerione

5.6 To <u>provide the electric energy</u>/source of energy that will drive the nonspontaneous reaction into electroplating the spoon. ✓✓ (2)
Om die <u>elektriese energie/bron van energie te verskaf</u> wat die nie-spontane reaksie moet dryf om die lepel te elektroplateer.

5.7 $AgNO_3$ ✓ / Silver nitrate /Silver salt solution (1)
$AgNO_3$ / Silwer nitraat /Silwer sout oplossing

5.8 A deposit of silver on the surface of the spoon. ✓
A decrease in mass of the silver (anode) electrode. ✓ (2)
'n Silwer neerlaag wat gesien kan word op die lepel.
Die massa van die silwer (anode) elektrode verminder.

[13]

QUESTION/VRAAG 6

6.1 An electrochemical cell that converts chemical energy to electrical energy ✓✓ (2)
'n Elektrochemiese sel wat chemiese energie omskakel in elektriese energie.

6.2 Temperature = 298 K/ 25 °C ✓ (2)
Temperatuur = 298 K/ 25 °C

Concentration = 1 mol. dm^{-3} ✓
Konsentrasie = 1 mol. dm^{-3}

6.3 From Zn (electrode) to the Cu (electrode). ✓ (1)
Vananf die Zn (elektrode) na die Cu (elektrode).

6.4 Exothermic reaction ✓ because energy is released. ✓ (2)
Eksotermiese reaksie want energie word vrygestel.

6.5 Gain of electrons. ✓ ✓ (2)
Wins aan elektrone.

6.6.1 $Zn \rightarrow Zn^{2+} + 2e^{ï}$ ✓✓ (2)

Marking criteria/ *Merk riglyne*	
$Zn^{2+} + 2e^{ï} \leftarrow Zn$ (2/2)	$Zn \leftrightharpoons Zn^{2+} + 2e^{ï}$ (1/2)
$Zn^{2+} + 2e^{-} \leftrightharpoons Zn$ (0/2)	$Zn \leftarrow Zn^{2+} + 2e^{ï}$ (0/2)

6.6.2 $Zn(s) \mid Zn^{2+}(1\ mol.dm^{ï\,3})(aq)$ ✓ || ✓ $Cu^{2+}(1\ mol.dm^{ï\,3})(aq) \mid Cu\ (s)$ ✓

Accept /*Aanvaar:* $Zn(s) \mid Zn^{2+}\ (aq)$ ✓ || ✓ $Cu^{2+}\ (aq) \mid Cu\ (s)$ ✓ (3)
(**Do not penalise if phases are not included**.)
*(**Moenie penaliseer as fases nie gewys is nie.**)*

6.7

OPTION/*OPSIE 1:*	**OPTION/*OPSIE 2:***
$E^{\circ} = E^{\circ}_{cathode} - E^{\circ}_{anode}$ ✓ $= 0,34$ ✓ – (– 0, 76✓) = 1, 1 V ✓ **NOTE:** Use any correct formula given in the data sheet./ ***LET WEL**:Enige van die formules op die gegewensbladsy kan gebruik word*.	$Zn \rightarrow Zn^{2+} + 2e^{ï}$ ï (– 0, 76✓) $Cu^{2+} + 2e^{ï}$ Ÿ Cu (+0, 34 ✓) $Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu$ 1, 1V✓

(4)

6.8
- Complete the circuit.✓
  Voltooi die stroombaan (2)
- Provide passage for ions ✓
  Voorsien deurgang vir ione.
- Maintains electrical neutrality in the cell.
  Verseker elektriese neutraliteit in die selle.
  (Any TWO/ *Enige TWEE*)

6.9 Because it will not form a precipitate with any other ions ✓and do not prevent movement of ions ✓ between two half cells. (2)
Omdat dit wil nie'n neerslag vorm met enige ander ione nie en dit blokeer ook nie die vloei van ione nie.

[22]

QUESTION/*VRAAG 7*

7.1 When light falls upon a plane surface it is reflected that the angle of reflection is equal to the angle of incidence. ✓
The incident ray, the refracted and the normal all lie in the same plane. ✓ (2)

Wanneer lig op 'n platvlak val, weerkaats dit sodat die weerkaatsingshoek gelyk is aan die invalshoek.
Die invalstraal, weerkaatste straal en normaal lê almal op dieselfde vlak.

7.2
- The image is the same size as the object. ✓ (4)
- The distance from the object to the mirror equals the distance from the image to the mirror. ✓
- The image is virtual. ✓
- The image is also laterally inverted, which means they have a left right inversion. ✓
- The image is upright. **(Any FOUR)**

- *Die beeld is dieselfde grootte as die voorwerp.*
- *Die afstand van die voorwerp na die spieël is gelyk aan die afstand van die beeld na die spieël.*
- *Die beeld is 'n virtuele beeld.*
- *Hierdie beelde is ook sydelings omgekeerd wat beteken dat hulle 'n links-regs omkering het.*
- *Die beeld is regop.* ***(Enige VIER)***

7.3.1 Normal / normal line ✓✓ (2)
Normaal/ normaal lyn

7.3.2 Diffused ✓✓ (2)
Diffusie

7.4

7.4.1 The phenomenon whereby white light breaks up into its component colours. ✓✓ (2)
Die verskynsel waardeur wit lig opbreek in sy samestellende kleure.

7.4.2 Red ✓ (1)
Rooi

7.4.3 It has longest wavelength. ✓
The longer the wavelength the less the refraction. ✓ (2)
Dit het die langste golflengte.
Hoe langer die golflengte hoe minder is die breking.

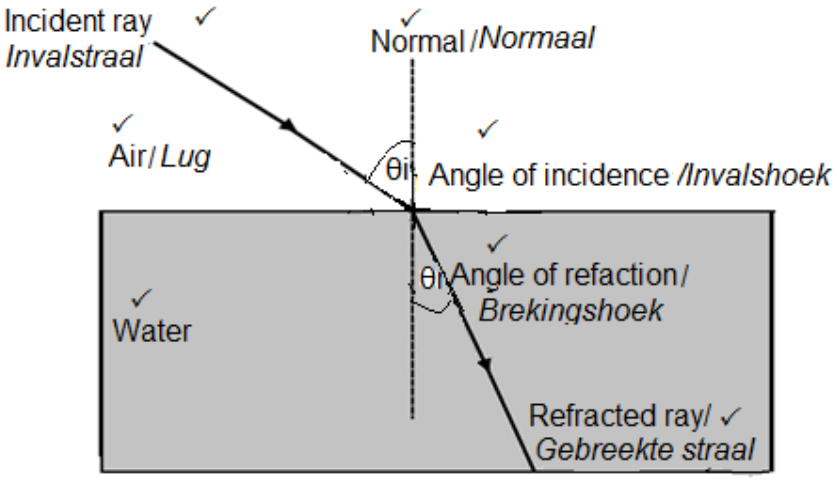
7.4.4 Violet ✓ (1)
[16]

QUESTION/*VRAAG 8*

8.1

8.1.1 Refraction is the bending of light when it passes from one medium to another. ✓✓ (2)
Die buiging van lig as dit deur een medium na 'n volgende beweeg.

8.1.2



(7)

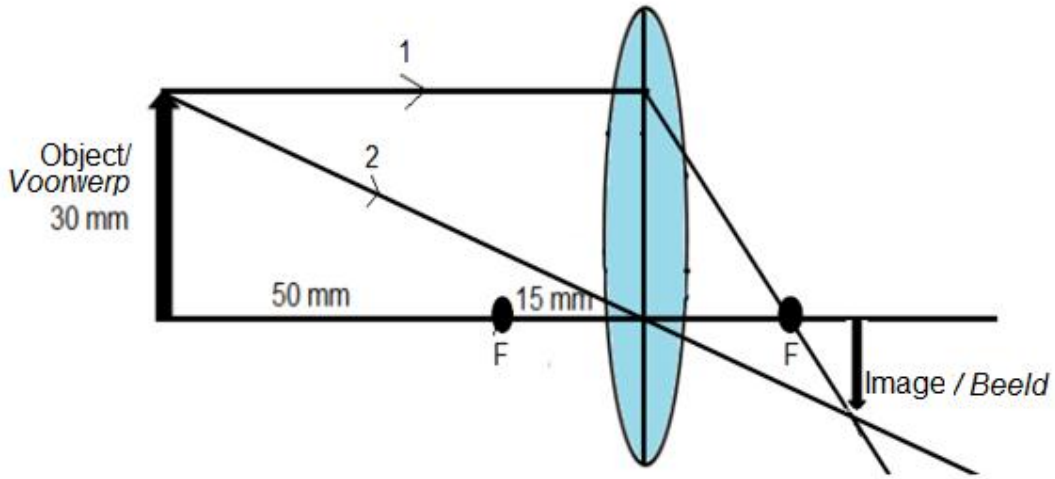
8.1.3 Decrease ✓ (1)
Verminder

8.2 Light must travel from a more optically dense medium /of high refractive index to a less optically dense medium/of low refractive index.✓✓
Incident angle must be greater than critical angle. ✓✓ (4)
Lig moet van 'n digter na 'n minder digte optiese medium beweeg.
Die invalshoek van die ligstraal moet groter as die grootte van die grenshoek wees.

8.3 Communication ✓
Medicine ✓
Illuminating models/road signs
Security fencing
Fibre optic lamp (ANY TWO RELEVANT APPLICATIONS**)** (2)

Kommunikasie
Mediese veld
Padtekens
Sekuriteitsheinings
Veseloptiese lamp (ENIGE TWEE RELEVANTE TOEPASSINGS)

8.4



Marking criteria/ *Merk riglyne* (5)

- Object height of 30 mm.✓
  Voorwerp se hoogte is 30 mm.
- Object placed 50 mm from the lens.✓
  Voorwerp is 50 mm voor die lens.
- Ray 1 parallel to the principal axis and passes through focal length on the other side of the lens.✓
  Straal 1 is parallel met die hoofas en gaan deur die brandpunt aan die anderkant van die lens.
- Ray 2 passing straight through the optical centre without deviating. ✓
  Straal 2 gaan deur die optiese middelpunt.
- Inverted, diminished image formed between F and 2F. ✓
  Omgekeerde, kleiner beeld word gevorm tussen F en 2F.

NOTE: Diagram not drawn to scale.
***LET WEL:** Diagram is nie op skaal nie.*

8.5 Near-sightedness ✓/ myopia
Farï sightedness/hyperopia ✓ (2)
Kortsigtigheid / miopiese/ Bysiendheid
Versiendheid

[23]

QUESTION/ VRAAG 9

9.1 Is a changing magnetic and electric field mutually perpendicular to each other and the direction of propagation of the wave. ✓✓ (2)
Veranderende magnetiese en elektriese velde wat loodreg op mekaar en die rigting van die voortplantings golwe.

9.2.1

Radio Waves/ *Radio golwe*	Microwaves /*Mikrogolwe*	Infrared Waves/ *Infrarooi*	Visible Light/ *Sigbare lig*	Ultraviolet	Xï ray/ *X– strale*	Gamma ray/ *Gammastrale*

. **Marking criteria/ *Merk riglyne***

- First 3 correct.✓ *Eerste 3 korrek.*
- Last 4 correct. ✓ *Laaste 4 korrek*

(2)

9.3

9.3.1 Ultraviolet ✓ (1)

9.3.2 Microwave ✓ (1)
Mikrogolf

9.4 $E = hf$ ✓
$3,44 \times 10^{-23}$ ✓ $= 6,63 \times 10^{-34}$ ✓ $\times f$
$f = 5,19 \times 10^{10}$ Hz✓ (4)
[10]

TOTAL: 150

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Question No.	Taxonomy														Knowledge area				
		KNOWLEDGE ,RECALL, Low Demand			COMPREHENSION and ROUTINE APPLICATION			APPLICATION & ANALYSIS, Problem Solving			EVALUATION AND CREATING			TOTAL	Organic chemistry	Electrochemical cell	Waves, Sound and light	TOTAL MARKS	Question Totals
	Content	E	M	D	E	M	D	E	M	D	E	M	D		Marks				
1.1	Organic chemistry		2											2	2			2	
1.2	Organic chemistry			2										2	2			2	
1.3	Organic chemistry						2							2	2			2	
1.4	Organic chemistry			2										2	2			2	
1.5	Electrochemical cell				2									2		2		2	
1.6	Electrochemical cell									2				2		2		2	
1.7	Waves, Sound and light						2							2			2	2	
1.8	Waves, Sound and light										2			2			2	2	
1.9	Waves, Sound and light						2							2			2	2	
1.10	Waves, Sound and light			2										2			2	2	20
2.1.1	Organic chemistry	2												2	2			2	
2.1.2	Organic chemistry	2												2	2			2	
2.2.1	Organic chemistry				2									2	2			2	
2.2.2	Organic chemistry		1											1	1			1	
2.2.3	Organic chemistry						2							2	2			2	
2.2.4	Organic chemistry			1										1	1			1	
2.2.5.	Organic chemistry				1									1	1			1	
2.3	Organic chemistry																		
2.3.1	Organic chemistry		2											2	2			2	
2.3.2	Organic chemistry				1									1	1			1	
2.3.3	Organic chemistry				1									1	1			1	

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	Content	E	M	D	E	M	D	E	M	D	E	M	D		Marks				
2.3.4	Organic chemistry			1										1	1			1	
2.4	Organic chemistry									3				3	3			3	19
3.1.	Organic chemistry		2											2	2			2	
3.2.1	Organic chemistry						1							1	1			1	
3.2.2	Organic chemistry						1							1	1			1	
3.3	Organic chemistry				1		1							1	1			1	
3.4	Organic chemistry									3				3	3			3	
3.5	Organic chemistry			1										1	1			1	
3.6	Organic chemistry				2									2	2			2	
3.7	Organic chemistry				2									2	2			2	13
4.1.1	Organic chemistry								1					1	1			1	
4.1.2	Organic chemistry								1					1	1			1	
4.1.3	Organic chenistry								1					1	1			1	
4.3	Organic chenistry									5				5	5			5	
4.4.1	Organic chemistry	2												2	2			2	
4.4.2	Organic chemistry			1			1							1	1			1	**14**
5.1	Electrochemical cell			2										2		2		2	
5.2	Electrochemical cell	2												2		2		2	
5.3	Electrochemical cell				2									2		2		2	
5.4	Electrochemical cell							2						2		2		2	
5.5	Electrochemical cell						1							1		1		1	
5.6	Electrochemical cell			2										2		2		2	
5.7	Electrochemical cell							2						2		2		2	
5.8	Electrochemical cell			2										2		2		2	**13**
6.1.	Electrochemical cell			2										2		2		2	

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	Content	E	M	D	E	M	D	E	M	D	E	M	D		Marks				
6.2.	Electrochemical cell				2									2		2		2	
6.3.	Electrochemical cell				1									1		1		1	
6.4	Electrochemical cell									2				2		2		2	
6.5	Electrochemical cell	2												2		2		2	
6.6.1	Electrochemical cell										2			2		2		2	
6.6.2	Electrochemical cell											3		3		3		3	
6.7	Electrochemical cell												4	4		4		4	
6.8	Electrochemical cell			2										2		2		2	
6.9	Electrochemical cell				2									2		2		2	**22**
7.1	Waves, sound and light			2										2			2	2	
7.2	Waves, sound and light				4									4			4	4	
7.3.1	Waves, sound and light		2											2			2	2	
7.3.2	Waves, sound and light	2												2			2	2	
7.4.1	Waves, sound and light		2											2			2	2	
7.4.2	Waves, sound and light				2									2			2	2	
7.4.3	Waves, sound and light			2										2			2	2	
7.4.4	Waves, sound and light		1											1			1	1	**16**
8.1.1	Waves, Sound and light			2										2			2	2	
8.1.2	Waves, Sound and light									7				7			7	7	

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	Content	E	M	D	E	M	D	E	M	D	E	M	D		Marks				
8.1.3	Waves, Sound and light				1									1			1	1	
8.2	Waves, Sound and light				4									4			4	4	
8.3	Waves, Sound and light	2												2			2	2	
8.4	Waves, Sound and light												5	5			5	5	
8.5	Waves, Sound and light		2											2			2	2	**23**
9.1	Waves, Sound and light			2										2			2	2	
9.2	Waves, Sound and light				2									2			2	2	
9.3.1	Waves, Sound and light			1										1			1	1	
9.3.2	Waves, Sound and light			1										1			1	1	
9.4	Waves, Sound and light							3						3			3	3	**10**
	TOTAL	**14**	**22**	**30**	**32**	**0**	**13**	**7**	**3**	**22**	**4**	**3**	**9**	**150**	**55**	**41**	54	**150**	**150**
		Exp cog level 1			**Exp cog level 2**			**Exp cog level 3**			**Exp cog level 3**				**Organic chemistry**	**Electrochemical cell**	**Waves, sound and light**		
		60/150			**45/150**			**30/150**			**15/150**				**54**	**42**	**54**		
		0			**0**						**0**								

TECHNICAL SCIENCE P2 GRID **NW/SEPTEMBER 2019**

Question No.		Taxonomy													Knowledge area				
		KNOWLEDGE ,RECALL, Low Demand			COMPREHENSION and ROUTINE APPLICATION			APPLICATION & ANALYSIS, Problem Solving			EVALUATION AND CREATING			TOTAL	Organic chemistry	Electrochemical cell	Waves, Sound and light	TOTAL MARKS	Question Totals
	Content	E	M	D	E	M	D	E	M	D	E	M	D		Marks				
		63			45			32			16			150	55	41	53		
			42			30			21.33			10.67		104	36.7%	27%	35%		
														0					

E	M	D
32	63	55
21 %	42 %	37 %

150