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PREPARATORY EXAMINATION

VOORBEREIDENDE EKSAMEN

2019

MARKING GUIDELINES / *NASIENRIGLYNE*

TECHNICAL SCIENCES/ *TEGNIESE WETENSKAPPE*

(PAPER / *VRAESTEL 2*)

11102

12 pages / *bladsye*

**GAUTENG DEPARTMENT OF EDUCATION /
GAUTENGSE DEPARTEMENT VAN ONDERWYS**

PREPARATORY EXAMINATION / VOORBEREIDENDE EKSAMEN

**TECHNICAL SCIENCES / TEGNIESE WETENSKAPPE
(Paper / Vraestel 2)**

MARKING GUIDELINES / NASIENRIGGLYNE

QUESTION / VRAAG 1

- | | | |
|------|------|-------------|
| 1.1 | D ✓✓ | (2) |
| 1.2 | C ✓✓ | (2) |
| 1.3 | A ✓✓ | (2) |
| 1.4 | D ✓✓ | (2) |
| 1.5 | A ✓✓ | (2) |
| 1.6 | B ✓✓ | (2) |
| 1.7 | C ✓✓ | (2) |
| 1.8 | C ✓✓ | (2) |
| 1.9 | D ✓✓ | (2) |
| 1.10 | D ✓✓ | (2) |
| | | [20] |

QUESTION / VRAAG 2

- 2.1 A series of compounds that can be described by the general formulae ✓ in which they differ – CH₂ group. ✓ / 'n Reeks organiese verbindings wat deur dieselfde algemene formule beskryf kan word en waarin die een lid van die volgende verskil met CH₂-groep. (2)
- 2.2.1 Alkene / Alkeen ✓ (1)
- 2.2.2 Ester ✓ (1)
- 2.2.3 Alkane / Alkaan ✓ (1)
- 2.3.1 Hydroxyl group ✓ / Hidroksielgroep (1)
- 2.3.2 Carboxyl group ✓ / Karboksielgroep (1)

2.4 2.4.1 1-chloro[✓]propane[✓] /
1-chloropropaan

If hyphen is omitted (1/2) /
Koppelteken uitgelaat (1/2)

(2)

2.4.2 Butan-2[✓]-ol[✓] /
Butan-2-ol

If hyphen is omitted (1/2) /
Koppelteken uitgelaat (1/2)

(2)

2.4.3 2-methylprop[✓]-1-ene[✓] /
2-metielp-1-een

If hyphen is omitted (1/2) /
Koppelteken uitgelaat (1/2)

(2)

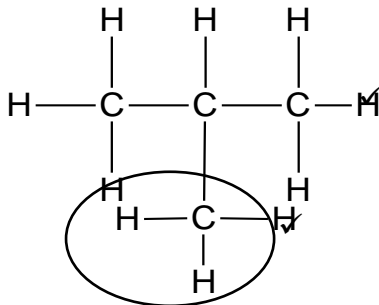
2.5 B[✓], C[✓], F[✓] and H[✓]

(4)

2.6 D and G[✓] / D en G
B and H[✓] / B en H

(2)

2.7

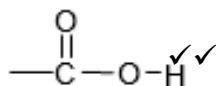


Marking criterion / Nasienriglyne

- Whole structure correct[✓] / Hele struktuur korrek
- Methyl on second carbon[✓] / Metiel op 2de C

(2)

2.8



(2)
[23]

QUESTION / VRAAG 3

3.1 The temperature at which the vapour pressure is equal to the atmospheric pressure ✓✓ / *Die temperatuur waar die dampdruk gelyk is aan die atmosferiese druk.* (2)

3.2.1 Hexane ✓ / *Heksaan* (1)

- 3.2.2
- Hexane has a larger molecular mass/number of carbons than butane. ✓ / *Heksaan het 'n groter molekulêre massa / aantal C-atome as butaan.*
 - The intermolecular forces/london forces/ion dipole forces between molecules of hexane are stronger than those between molecules of butane. ✓ / *Intermolekulêre kragte / london / ioon dipool kragte tussen molekule van heksaan is groter as tussen molekule van butaan.*
 - More energy is required to overcome intermolecular forces of hexane than those of butane. ✓ / *Meer energie is nodig om intermolekulêre kragte van heksaan te oorkom, minder energie nodig om IM kragte van butaan te oorkom*

OR / OF

- Butane has a lower molecular mass/number of carbons than hexane. ✓ / *Butaan het kleiner molekulêre massa/getal C-atome as heksaan.*
- The intermolecular forces/london forces/ion dipole forces between molecules of butane are weaker than those between molecules of hexane. ✓ / *Die IM kragte/london/ioon dipool kragte tussen molekule van butaan is swakker as tussen molekule van heksaan.*
- Less energy is required to overcome intermolecular forces of butane than those of hexane. ✓ / *Minder energie nodig om IM van butaan te oorkom as die van heksaan.* (3)

3.2.3 Methane ✓ / *Metaan* (1)

- 3.2.4
- The boiling point of methane is lower than that of pentane. ✓ / *Die kookpunt van metaan is laer/minder as diè van pentaan.*
 - The lower the boiling point, the more the vapour pressure. ✓ / *Hoe laer / kleiner die kookpunt, hoe meer die dampdruk.* (2)

[9]

QUESTION / VRAAG 4

- 4.1 Saturated hydrocarbons have single bonds only. ✓ / *Versadigde koolwaterstowwe het slegs enkele bindings.*
 Unsaturated hydrocarbons have double or triple bonds. ✓ / *Onversadigde koolwaterstowwe het dubbel of drievoudige bindings.* (2)
- 4.2.1 Reaction 1 – hydrohalogenation ✓ (accept: addition) / *Reaksie 1 – hidrohalogenering (aanvaar addisie)* (1)
- 4.2.2 Reaction 2 – hydrolysis ✓ (accept: substitution) / *Reaksie 2 – hidroliese (aanvaar substitusie)* (1)
- 4.2.3 Reaction 3 – hydration ✓ (accept addition) / *Reaksie 3 – hidrasie (aanvaar addisie)* (1)
- 4.3.1 Low / mild temperatures ✓ / *Lae / matige temperature*

OR / OF

- A dilute solution of a strong base (e.g. NaOH).
 (Any ONE / Enige EEN) / *Verdunde oplossing van 'n sterk basis van NaOH* (1)
- 4.3.2 Water must be present in excess. ✓ / *Water in oormaat*
 An acid catalyst (H_3PO_4) is needed for this reaction to take place. ✓ / *'n Suur katalis (H_3PO_4) is nodig vir die reaksie om plaas te vind.* (2)
- 4.4 $2 C_4H_{10} + 13O_2 \checkmark \rightarrow 8CO_2 + 10H_2O \checkmark$ (bal) ✓

Marking criterion / Nasienriglyne

- **Reactants ✓ / Reaktante**
- **Products ✓ / Produkte**
- **Balancing ✓ / Balansering**

- 4.5 Ethene ✓ / *Eteen* (1)
- 4.6 Making plastic products such as / *Maak plastiek produkte soos*
 Film ✓ / *Film (bv. "glad wrap", plastiek sake, voering in karton houers*
 Injection moulding ✓ / *Spuitgiet (bv. bakke, emmers, kratte, asblikke)*
 Blow moulding / *Blaasvorming (bv. spuitbottels)*
 Extrusion / *Extrusie (bv. buigbare waterpype, kabel omhulsels)*
 (Accept any TWO applicable uses.) / *(Aanvaar enige TWEE toepaslike gebruike.)* (2)

[14]

QUESTION / VRAAG 5

- 5.1 Splitting up (decomposition) of a compound using electrical current. ✓✓ /
Opbreek van 'n chemiese stof d.m.v. elektriese stroom

OR / OF

The chemical process where electrical energy is transformed into chemical energy / Die chemiese proses waar elektriese energie omgeskakel word in chemiese energie (2)

- 5.2 Electrical energy is converted into chemical energy. ✓✓ / Elektriese energie word omgeskakel in chemiese energie. (2)

- 5.3 B ✓ (1)

- 5.4 Chlorine gas, ✓ Cl₂✓ / Chloorgas, Cl₂ (2)

- 5.5 Cations-Cu²⁺ ✓ / Katione-Cu²⁺
Anions-Cl⁻ ✓ / Anione-Cl⁻ (2)

- 5.6 Copper /Cu deposit ✓ / Koperneerslag/ Cu-neerslag (1)

- 5.7.1
- Less pollution because of less CO₂ exhaust fumes ✓
 - Lower CO₂ emission reduces the effect of global warming. ✓
 - Effective recycling of waste products such as used fats and oils.
- (Any TWO)
- *Minder besoedeling a.g.v. CO₂ uitlaatgasse.*
 - *Minder CO₂ gasse verminder die effek van aardverwarming.*
 - *Effektiewe herwinning van afvalprodukte soos gebruikte vette en olies.*
- (Enige TWEE) (2)

- 5.7.2
- Solar energy /photovoltaic cells✓ / Sonenergie / Fotorottaïese selle
 - biodiesel✓
 - Wind energy / Wind energie
 - Hydroelectricity / Hidroelektrisiteit
- (Any TWO) / (Enige TWEE) (2)

[14]

QUESTION / VRAAG 6

6.1 An electrochemical cell where chemical energy is converted into electrical energy ✓✓ / *Elektrochemiese sel waar chemiese energie omgeskakel word in elektriese energie* (2)

6.2.1 Copper (electrode) ✓ / *Koper (elektrode)* (1)

6.2.2 Zinc sulphate (ZnSO₄)/zinc nitrate (ZnNO₃) ✓ / *Sinksulfaat (ZnSO₄) / Sinknitraat (ZnNO₃)*
(Accept any Zn electrolyte that does not form a precipitate. / *Aanvaar enige Zn elektroliet wat nie 'n neerslag vorm nie.*) (1)

6.2.3 Salt bridge ✓ / *Soutbrug* (1)

6.2.4 0 V ✓ (1)

6.2.5 The cell is incomplete. ✓✓ / *Sel is onvolledig*

OR / OF

No ions are moving in the circuit. / *Geen ione kan in die stroombaan beweeg nie.* (2)

6.2.6 KNO₃ / KCl ✓ (1)

6.2.7 From E to D ✓ / *Van E na D* (1)

6.3 Zn(s) ✓ → Zn²⁺(aq) + 2e⁻ ✓

<p><u>Marking criterion / Nasienriglyne</u></p> <ul style="list-style-type: none"> • Reactants ✓ / Reaktante • Products ✓ / Produkte • Balancing ✓ / Balansering

- **Reactants ✓ / Reaktante**
- **Products ✓ / Produkte**
- **Balancing ✓ / Balansering**

(2)

6.4 Temperature = 298K/25 °C ✓ / *Temperatuur = 298K/25 °C*
Concentration = 1mol.dm⁻³ ✓ / *Konsentrasie = 1mol.dm⁻³* (2)

6.5.1 Zinc / Zn electrode ✓ / *Sink/ Zn-elektrode* (1)

6.5.2 Zn (s) / Zn²⁺ (aq) ✓ (1 mol·dm⁻³) // ✓ Cu²⁺ (aq) / (1 mol·dm⁻³) Cu (s) ✓
All phases correct ✓ / *Alle fases korrek.* (4)

6.5.3 $E^{\circ}_{cell} = E^{\circ}_{cathode} - E^{\circ}_{anode}$ ✓ / $E^{\circ}_{sel} = E^{\circ}_{katode} / E^{\circ}_{anode}$
= 0,34 ✓ - (-0,76) ✓
= 1,1 V ✓ (4)

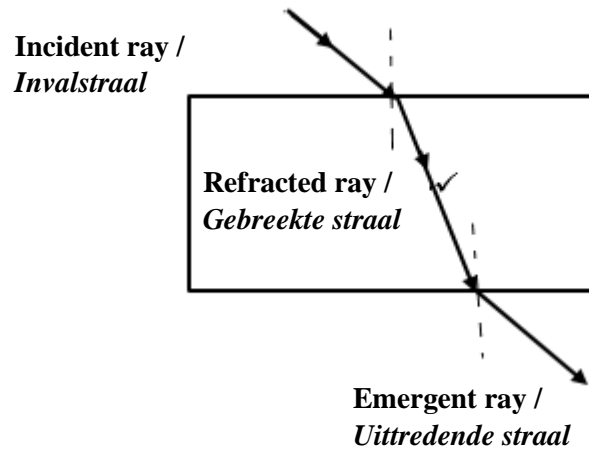
6.6 The solution will turn colourless. ✓ / *Die oplossing word kleurloos.* (1)

[24]

QUESTION / VRAAG 7

7.1 Refraction: The bending of light ✓ when it passes from one medium to another. ✓ / *Refraksie: Lig verander van rigting wanneer dit van een medium na 'n ander medium beweeg.* (2)

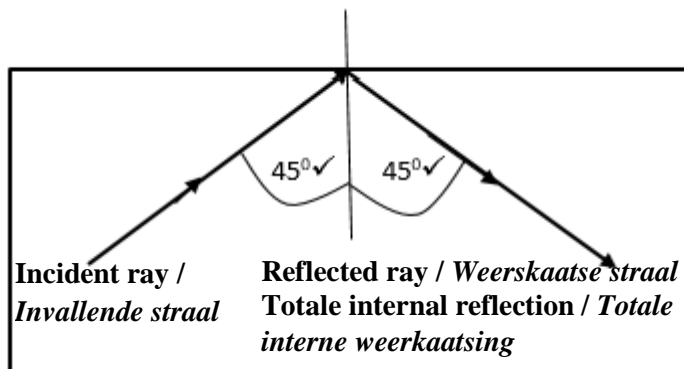
7.2



(2)

7.3.1 Critical angle: The angle of incidence in the denser medium ✓ such that the refracted ray just passes through the surface of separation of the two media. ✓ / *Grenshoek: die invalshoek in die digter medium sodat die gebreekte straal net deur die oppervlak wat die twee media skei, gaan.* (2)

7.3.2



Marking criterion / Nasien kriteria	Marks / Punte
Correct direction and label of incident ray / <i>Korrekte rigting en byskrif vir invallende straal</i>	1
Correct direction and label of reflected ray inside the glass slab / <i>Korrekte rigting en byskrif vir weerkaatste straal binne die glasblok</i>	1
Correct magnitude of incident angle / <i>Hoekgrootte invalshoek</i>	1
Correct magnitude of reflected angle inside the glass slab / <i>Korrekte grootte van weerkaatsingshoek binne die glasblok</i>	1

(4)

7.3.3 Total internal reflection ✓ / *Totale interne weerkaatsing*

(1)

7.3.4 Total internal reflection: When the angle of incidence is greater than the critical angle, ✓ the ray of light reflects into the original medium. ✓ / *Totale interne weerkaatsing: Wanneer die invalshoek groter is as die grenshoek, word die ligstraal terug weerkaats in die oorspronklike medium.*

(2)

7.3.5 Refractometers ✓ / *Refraktometer*Prisms in binoculars / *Prismas in verkykers*Optical finger printing devices / *Optiese vingerafdruk toestel*In fluorescence microscopes / *Fluoressensie mikroskoop*Gonioscopy / *Gonioskopie (meet vloeistof druk in die oog)*X-ray mirrors / *X-staal weerspieëling*Galt analysis instruments / *Galt analiese instrumente*Optical fibres in communication / *Optiese vessel in kommunikasie*Automotive rain sensors / *Outomatiese reënsensor*(Any ONE) / *(Enige EEN)*

(1)

7.3.6 The light is in the denser medium and approaching the less dense medium. ✓ / *Lig beweeg van opties digter medium na opties minder digte medium.*

The angle of incidence is greater than the critical angle. ✓ / *Invalshoek is groter as die grenshoek*

(2)

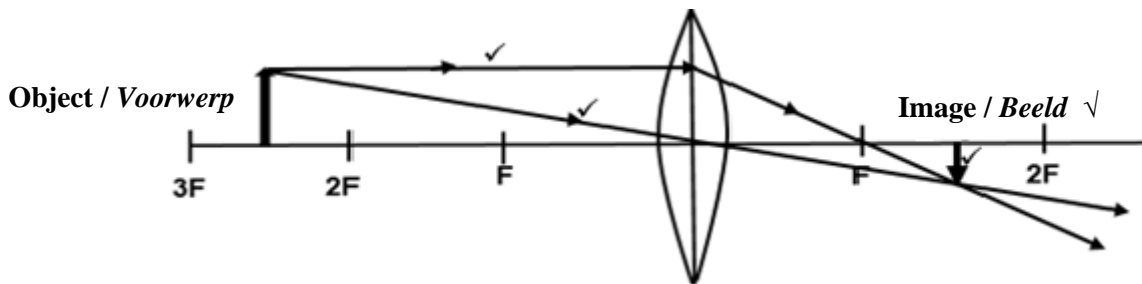
[16]

QUESTION 8 / VRAAG 8

8.1 Convex lens ✓ / *Konvekslens*

(1)

8.2



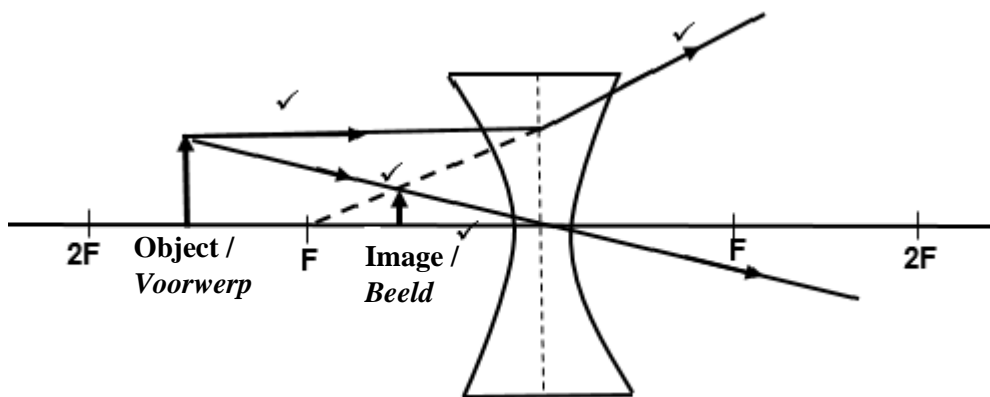
Marking criterion / <i>Nasienriglyne</i>	Marks / <i>Punte</i>
Ray parallel to the principal axis / <i>Straal parallel aan hoofas</i>	1
Ray passing straight through the optical centre / <i>Straal deur optiese middelpunt</i>	1
Image formed between F and 2F on the other side of the lens / <i>Beeld gevorm tussen F en 2F aan die ander kant van die lens</i>	1
Image is small and inverted / <i>Beeld is kleiner en omgekeerd</i>	1

(4)

8.3 Diminished / small ✓ / *Verklein*

Inverted ✓ / *Omgekeerd*

(2)



8.4.1

Marking criterion / Nasienriglyne	Marks / Punte
Ray from the top of the object parallel to the principal axis / <i>Straal vanaf die bopunt van die voorwerp, parallel aan hoofas</i>	1
Ray from the top of the object passing straight through the optical centre / <i>Straal vanaf bopunt van voorwerp, reguit deur optiese middelpunt</i>	1
Image formed at a point where a ray seeming to come from F meets the one passing the optical centre and diverging / <i>Beeld gevorm by 'n punt waar dit lyk of die straal vanaf F kom en kruis die straal deur die optiese middelpunt</i>	1
Diverging ray from the centre of the lens extrapolated from F / <i>Divergerende straal vanaf die middelpunt van die lens, terug verleng deur F</i>	1

(4)

8.4.2 Small / diminished✓ / *Klein / Verklein*Upright✓ / *Regop*

(2)

8.4.3 Far-sightedness / long-sightedness / hypermetropia / *Versiendheid / hipermetropie*

(1)

[14]

QUESTION 9 / VRAAG 9

9.1 Self-propagating, changing magnetic and electric fields that are mutually perpendicular to each other and to the direction of propagation ✓✓ / *Verandering van magnetiese en elektriese velde loodreg op mekaar en die rigting van die voortplanting van die golf.* (2)

9.2 Gamma rays, X-rays, ✓ ultraviolet trays, infrared rays ✓ microwaves, radio waves. ✓

Gamma, X-straal, UV, infrarooi mikrogolwe, radiogolwe

Marking criterion / Nasienriglyne

1 mark for 2 types of electromagnetic waves that follow each other in order of increasing wavelength / 1 punt vir 2 tipes elektromagnetiese golwe in volgorde

(3)

9.3.1 X-rays ✓ / *X-strale* (1)

9.3.2 Gamma rays ✓ / *Gammastrale* (1)

9.4 Ultraviolet rays cause the body to produce vitamin D, and this is used by doctors to treat vitamin D deficiency and some skin disorders. / *Ultravioletstrale help liggaam om Vit. D te produseer wat gebruik word om vit. D-tekorte aan te vul en sekere velkwale te verbeter.* (1)

9.5 $c = f\lambda$ ✓

$$3 \times 10^8 \text{ ✓} = 1,0 \times 10^{10} \times \lambda \text{ ✓}$$

$$= 3 \times 10^{-2} \text{m. ✓} \quad (4)$$

9.6 $E = hf = h\frac{c}{\lambda}$ ✓

$$= \frac{(6,63)(3 \times 10^8)(10^{-34})}{600 \times 10^{-9}}$$

$$= 3,32 \times 10^{-35} \text{ J ✓} \quad (4)$$

[16]**TOTAL / TOTAAL: 150**