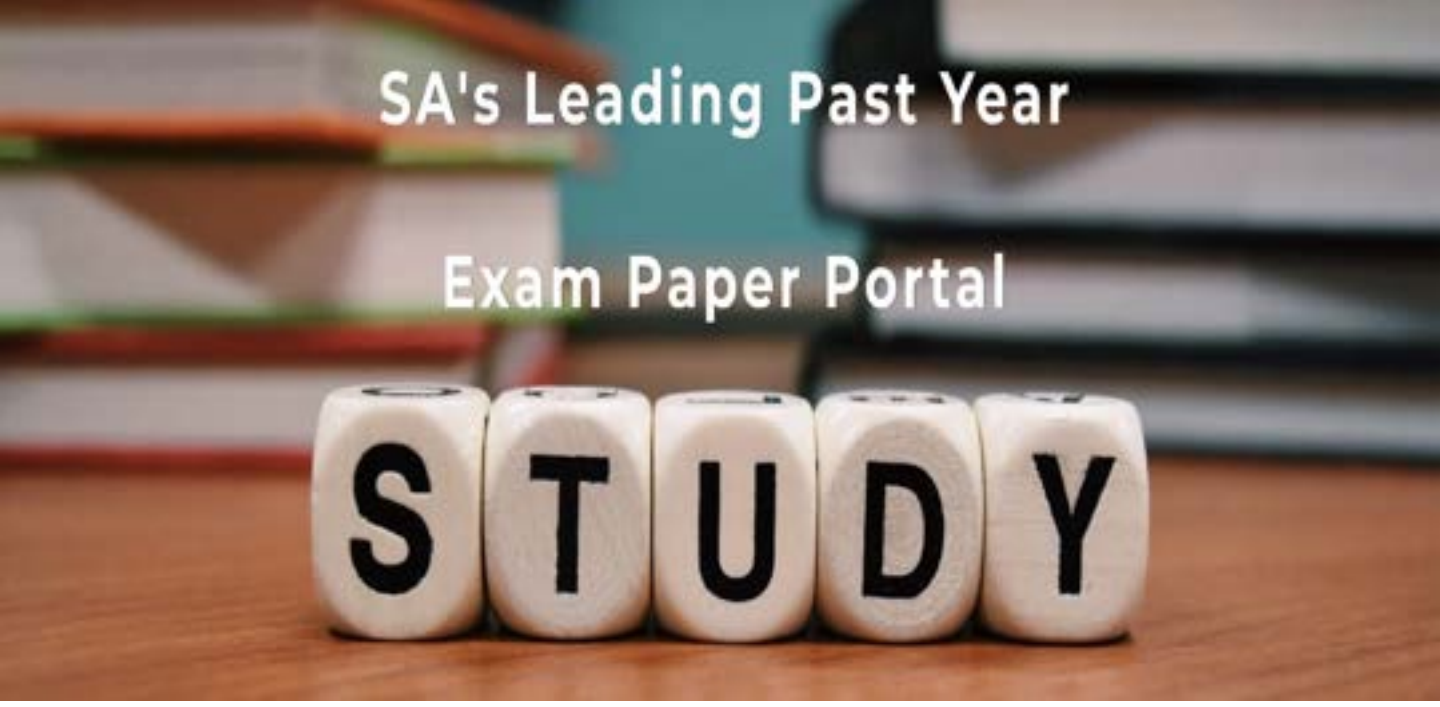

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EDUCATION
REPUBLIC OF SOUTH AFRICA

PREPARATORY EXAMINATION

VOORBEREIDENDE EKSAMEN

2019

MARKING GUIDELINES / *NASIENRIGLYNE*

TECHNICAL SCIENCES/ *TEGNIESE WETENSKAPPE*

(PAPER / *VRAESTEL* 2)

11102

12 pages / *bladsye*

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GAUTENG DEPARTMENT OF EDUCATION /
GAUTENGSE DEPARTEMENT VAN ONDERWYS

PREPARATORY EXAMINATION / *VOORBEREIDENDE EKSAMEN*

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

MARKING GUIDELINES / *NASIENRIGLYNE*

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 – CH_2 group. ✓ / *'n Reeks organiese verbindings wat deur dieselfde algemene formule beskryf kan word en waarin die een lid van die volgende verskil met CH_2-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-o1*

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

(2)

2.4.3 2-methylprop✓-1-ene✓/ *2-metielprop-1-een*

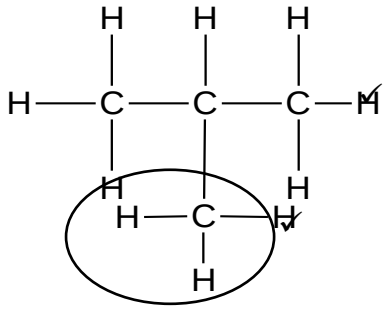
If hyphen is omitted (1/2) / *Koppelteken uitgelaat* (1/2)

(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

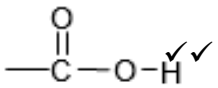


Marking criterian / *Nasienriglyne*

- **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 that 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 that those between molecules of hexane. ✓/ *Die IM kragte/london/ioondipool 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 $2\ C_4H_{10} + 13O_2$ ✓→ $8CO_2 + 10H_2O$✓ (bal) ✓

<u>Marking criterian / *Nasienriglyne*</u>

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

(3)

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, ✓ $C\ell_2$✓ / *Chloorgas, $C\ell_2$* (2)

5.5 Cations-Cu^{2+} ✓ / *Katione-Cu^{2+}*
Anions-$C\ell^-$ ✓ / *Anione-$C\ell^-$* (2)

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

5.7.1
- Less pollution because of less CO_2 exhaust fumes ✓
- Lower CO_2 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. CO_2 uitlaatgasse.*
- *Minder CO_2 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 ($ZnSO_4$)/zinc nitrate ($ZnNO_3$) ✓ / *Sinksulfaat ($ZnSO_4$) / Sinknitraat ($ZnNO_3$)*
(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 KNO_3 / KCℓ✓ (1)

6.2.7 From E to D✓ / *Van E na D* (1)

6.3 $Zn(s)$ ✓ → $Zn^{2+}(aq) + 2e$✓

Marking criterian / *Nasienriglyne*

- **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) / Zn^{2+} (aq) ✓ (1 mol·dm^{-3}) // ✓ Cu^{2+} (aq) / (1 mol·dm^{-3}) Cu (s) ✓
All phases correct✓ / *Alle fases korrek.* (4)

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

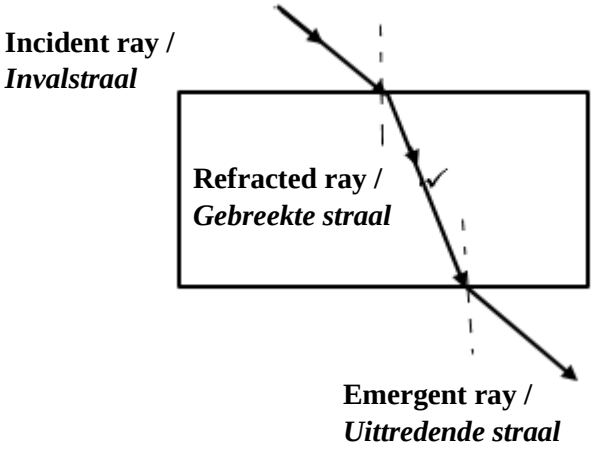
6.6 The solution will turn colourless. ✓/ *Die oplossing word kleurloos.* (1)

[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

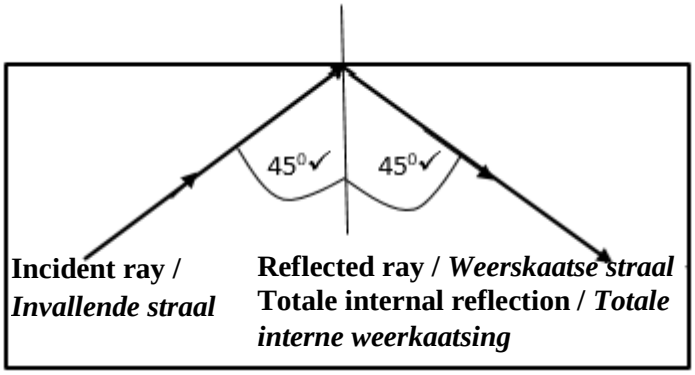


(2)

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 / *Korrekte rigting en byskrif vir invallende straal*	1
Correct direction and label of reflected ray inside the glass slab / *Korrekte rigting en byskrif vir weerkaatste straal binne die glasblok*	1
Correct magnitude of incident angle / *Hoekgrootte invalshoek*	1
Correct magnitude of reflected angle inside the glass slab / *Korrekte grootte van weerkaatsingshoek binne die glasblok*	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)

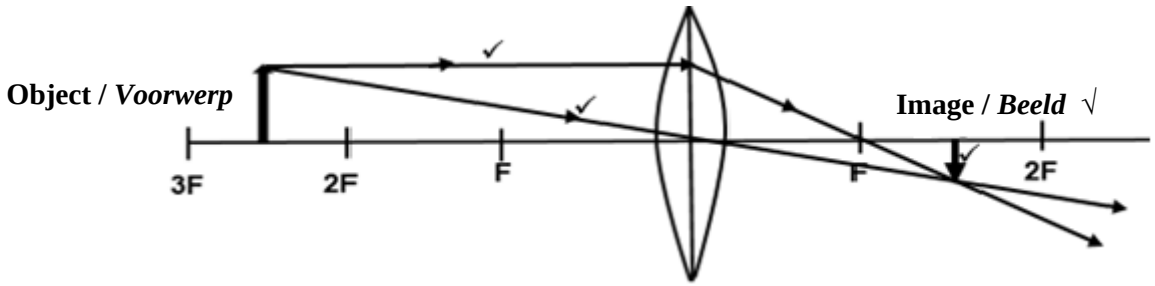
7.3.6 The light is in the denser medium and approaching the less dense medium. ✓ */ Lig beweeg van opties digter medium na opties minder digte medium.*
The angle of incidence is greater than the critical angle. ✓ / *Invalshoek is groter as die grenshoek* (2)

[16]

QUESTION 8 / VRAAG 8

8.1 Convex lens ✓ / *Konvekslens* (1)

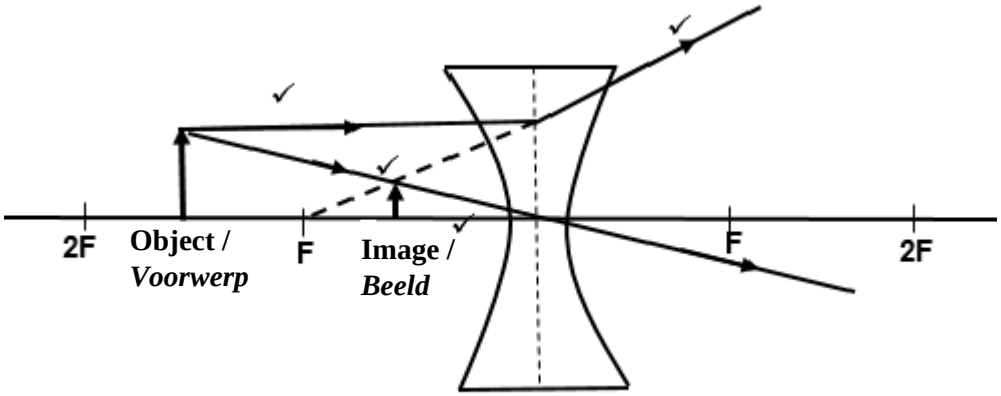
8.2



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

(4)

8.3 Diminished / small ✓ / *Verklein*
Inverted ✓ / *Omgekeerd* (2)



8.4.1

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

3×10^8 ✓ = 1,0 x 10^{10} x λ✓

= 3×10^{-2}m. ✓ (4)

9.6 $E = hf = h\frac{c}{\lambda}$✓

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

= $3{,}32 \times 10^{-35}$ J✓ (4)

[16]

TOTAL / TOTAAL: 150