GAUTENG DEPARTMENT OF EDUCATION
SENIOR CERTIFICATE EXAMINATION

FUNCTIONAL PHYSICAL SCIENCE SG
(First Paper: Physics)

TIME: 2 hours

MARKS: 150

REQUIREMENTS:

- An approved (non-programmable scientific) calculator. Candidates should supply their own calculators.

INSTRUCTIONS:

- Write your examination number and centre number in the spaces provided on the cover of the **answer book**.
- Answer ALL the questions.
- Answer Question 1 on the **answer sheet** on the **inside cover** of your **answer book**. Make a cross (**X**) over the letter **A**, **B**, **C** or **D** to indicate which letter you have chosen.
- Answer ALL other questions in your **answer book**. Number all answers in accordance with the question paper.
- An information sheet is provided at the end of this question paper. It contains equations and constants. Some of the information may be useful in answering this question paper.
- Rough work may be done at the **back** of the **answer book**.

QUESTION 1
MULTIPLE-CHOICE QUESTIONS

Each question has four possible answers (A, B, C and D). Choose the letter which in your opinion represents the correct answer and make a cross (**X**) over the corresponding letter on the **answer sheet** on the **inside cover** of your **answer book**. If more than one cross appears in an answer, NO MARKS will be awarded.

EXAMPLE:

At which temperature does pure ice melt?

A. -4°C
B. 0°C
C. 0 K
D. 4°C

ANSWER: | A | ~~B~~ | C | D |

1.1 When more resistors are added to a series circuit _____ .

A. the equivalent resistance increases
B. the equivalent resistance stays the same
C. the equivalent resistance decreases
D. the internal resistance decreases

1.2 Examples of the application of the motor-effect are the _____ .

A. galvanometer, voltmeter, thermometer and an electric motor
B. voltmeter, ammeter, thermometer and a dynamo
C. voltmeter, galvanometer, ammeter and a dynamo
D. galvanometer, voltmeter, ammeter and an electric motor

1.3 Which colour of light would reveal the least extent of diffraction?

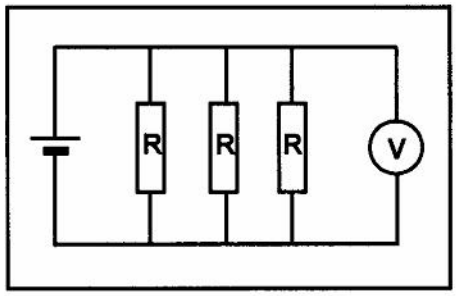
A. Yellow
B. Green
C. Violet
D. Red

1.4 Waves that undergo rectilinear movement, reflection, refraction, diffraction, polarisation and interference are _____ .

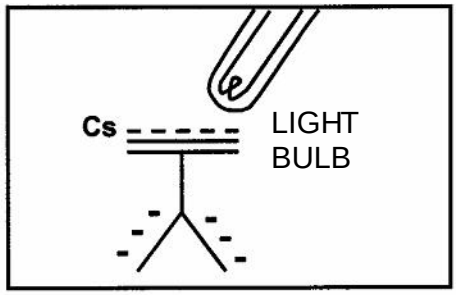
A. gamma-, ultraviolet-, x-rays, sound-, water- and radio waves
B. gamma-, ultraviolet-, x-rays, sound-, water- and light waves
C. gamma-, ultraviolet-, x-rays, visible light, infra-red, micro- and water waves
D. X-rays, visible light, infra-red, micro-, radio-, water- and sound waves

1.5 Which diagram illustrates current division?

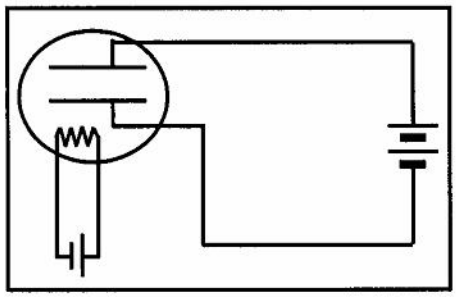
A.



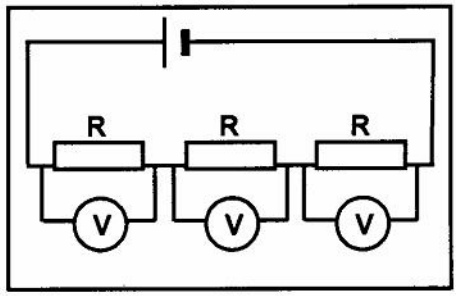
B.



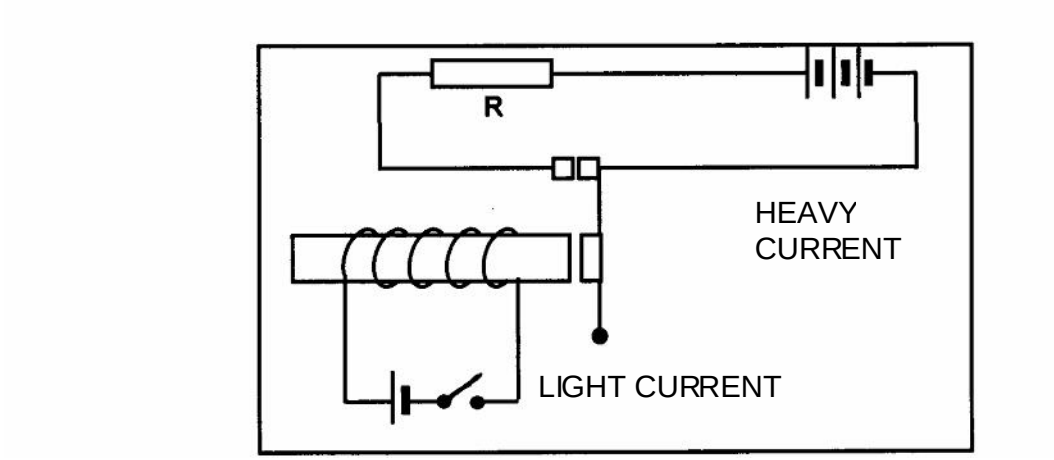
C.



D.



1.6



The principle demonstrated above, is applied by the _____ .

A. electric motor
B. transformer
C. relays
D. electric bell

1.7 Which two of the following components serve as amplifiers in an electric circuit?

A. A diode and a capacitor
B. A triode and a capacitor
C. A diode and a transistor
D. A triode and a transistor

1.8 Two wave patterns that have accelerating charges in common are _____ .

A. alternating current and water waves
B. electromagnetic waves and alternating current
C. alternating current and sound waves
D. electromagnetic- and sound waves

1.9 Which energy conversion takes place in a photocell?

A. Light to chemical
B. Kinetic to light
C. Light to potential
D. Light to electro-kinetic

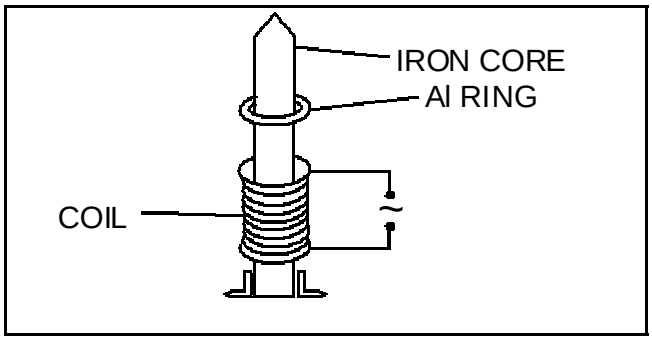
1.10 White light is shone at an angle onto a triangular glass prism. The light is separated into its component colours. What is this phenomenon called?

A. Interference
B. Dispersion
C. Polarization
D. Diffraction

1.11 Which statement is applicable to the photoelectric effect?
The photoelectric effect _____ .

A. can only occur with visible light
B. is evidence of the wave nature of light
C. is evidence of the particle nature of light
D. can only occur with the metal zinc

1.12 Lenz's law explains why the aluminium ring _____ .



A. rotates around the iron core
B. becomes very hot around the iron core
C. floats above the coil
D. changes form around the iron core

1.13 The colour of light is best associated with its _____ .

A. wavelength and frequency
B. amplitude and energy
C. wavelength and period
D. frequency and energy

1.14 Line spectra _____ .

A. are obtained when white light shines through a prism
B. are the physical identification of the flame colours of unknown metals
C. are proof of the electromagnetic nature of light
D. are obtained when the primary colours are diffracted through a single slit

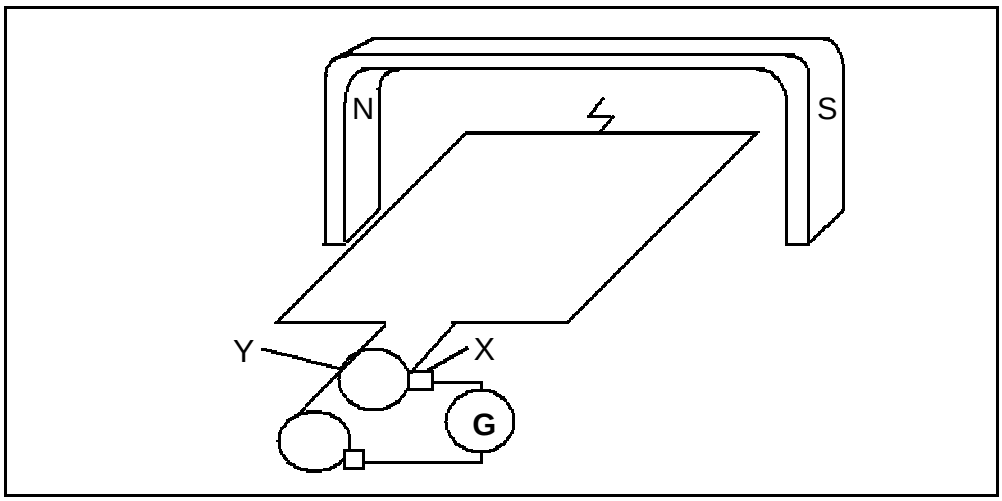
1.15 Which atom particles are liberated in a diode tube?

A. Protons
B. Electrons
C. Ions
D. Neutrons

15x(3)=**[45]**

QUESTION 2
INDUCTION

2.1 A science educator constructs the following experiment as in the sketch below. He rotates the turn clockwise through the magnetic field.



2.1.1 Name the phenomenon demonstrated above and provide a definition for it. (4)

2.1.2 Name the rule used to determine the direction of the current in the first quarter of rotation. (2)

2.1.3 Draw a sketch of the induced current. (2)

2.1.4 Name an application of this principle in practice. (2)

2.1.5 Name THREE ways to increase the induced current. (6)

2.1.6 Determine the frequency of this appliance if the turn is rotated 3 000 times per minute. (3)

2.2 Name the apparatus at

2.2.1 **X** and (2)

2.2.2 **Y**. (2)

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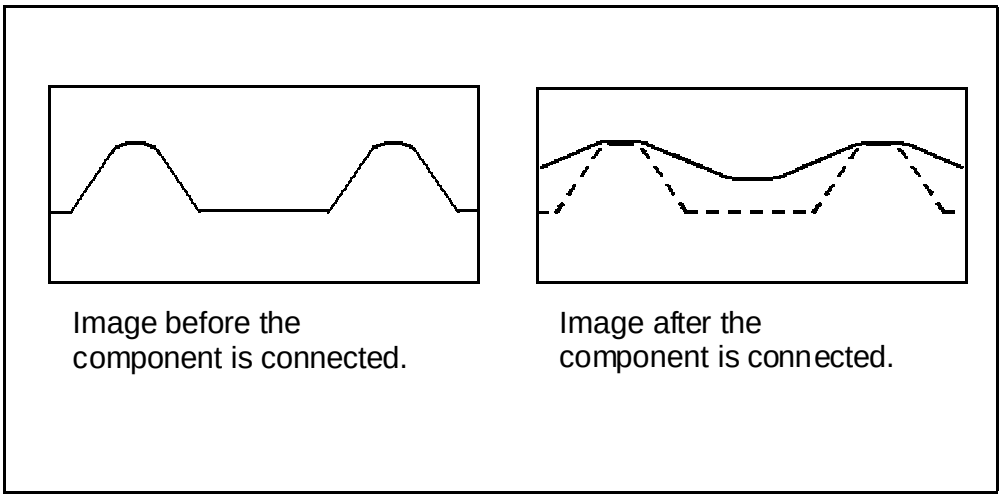
QUESTION 3
ELECTRONS IN THE ATOM

3.1 3.1.1 Define an **electric current**. (2)

3.1.2 Explain the term **electron current**. (2)

3.2 Meline connects a certain electrical component in an electric circuit. The component causes the image which is observed on the oscilloscope to change as follows:

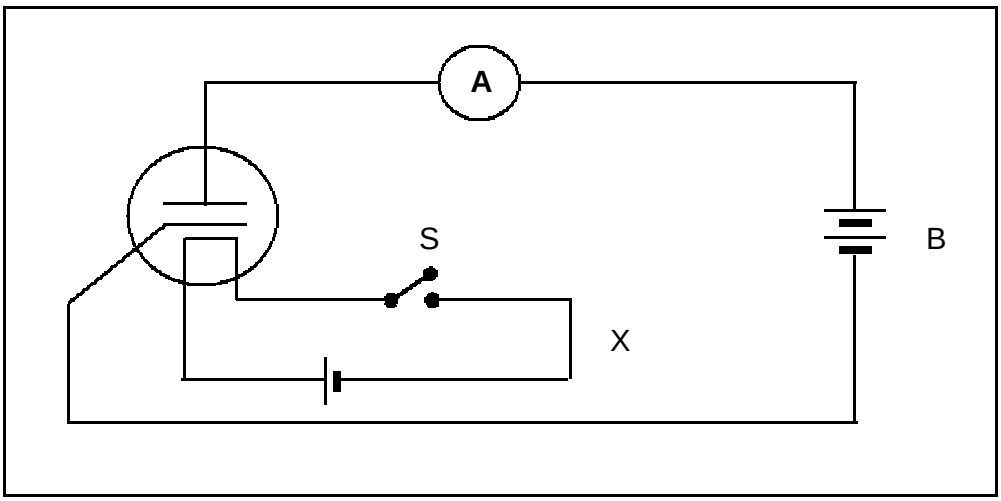


3.2.1 Which component is connected in the circuit? (2)

3.2.2 What is the function of this component? (2)

3.2.3 Name the wave pattern that this component is causing. (2)

3.3 The following diagram presents a thermionic diode, which is connected in a circuit.



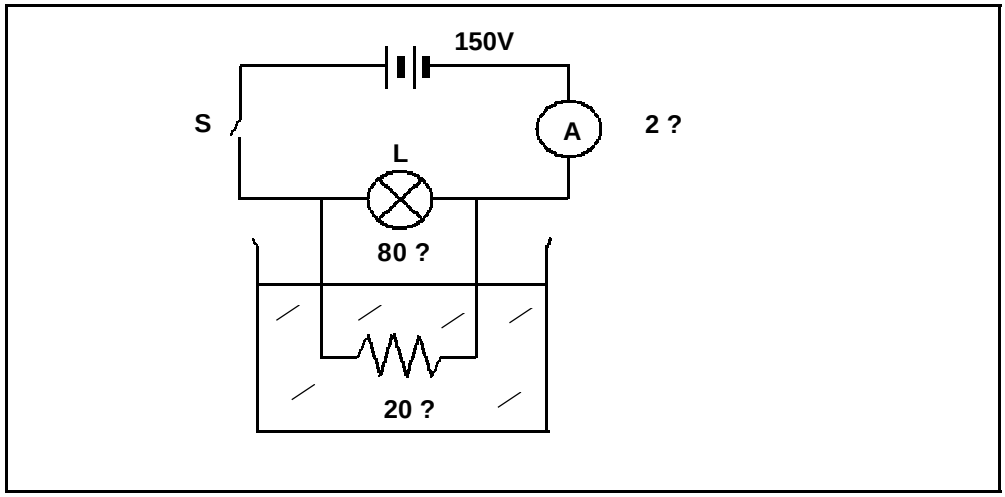
3.3.1 What is the function of circuit **X**? (2)

3.3.2 When the switch **S** is closed, there is a reading of 300 mA on the ammeter. What will happen to .the reading on the ammeter if the poles of battery **B** are switched around? (2)

3.3.3 Explain your answer to Question 3.3.2. (2)
[16]

QUESTION 4
OHM'S LAW

A heating element with a resistance of 20 ? is used to heat water as shown in the sketch below.



L is a bulb, which shows when the circuit is completed (closed). The water starts boiling 3 minutes after switch **S** is closed. The ammeter has a resistance of 2 ?.

4.1 Calculate the total resistance in the circuit. (5)

4.2 Calculate the reading on the ammeter when switch **S** is closed. (4)

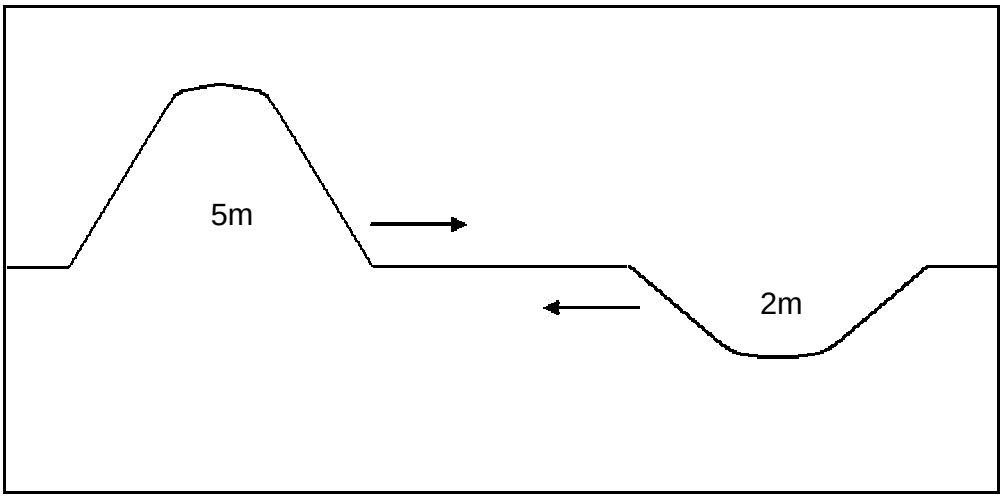
4.3 What is the current through bulb **L** when switch **S** is closed? (5)

4.4 If bulb **L** is removed from its socket, will it take a shorter, longer or the same time to boil the same volume of water? (2)

4.5 Explain your answer to Question 4.4. (4)
[20]

QUESTION 5
WAVES

5.1 Two wave pulses approach each other from opposite directions as shown in the sketch below.

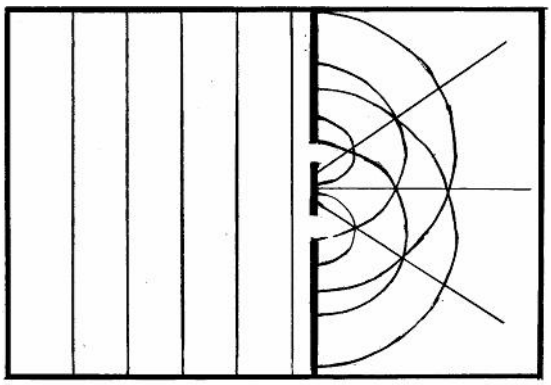


5.1.1 What would the magnitude of the amplitude be when the two pulses cross? (2)

5.1.2 What is this phenomenon called? (2)

5.1.3 What happens to the pulses after they have crossed? (2)

5.2 The wave pattern resulting from plane waves through two openings in an obstruction in a ripple tank is studied.



5.2.1 Name the phenomenon being observed. (2)

5.2.2 What are the fan-shaped lines in the pattern called? (2)

5.2.3 How are these lines formed? (2)

5.2.4 Name TWO ways in which the number of lines in the fan can be increased. (4)

5.3 Zander generates a pulse every 0,3 s in a ripple tank. The length of the waves is 90 mm. The maximum displacement of a floating particle on the surface of the water is 30 mm.

5.3.1 Express the amplitude of the waves in metre. (2)

5.3.2 Calculate the frequency of the waves. (3)

5.3.3 Calculate the speed of the waves. (4)

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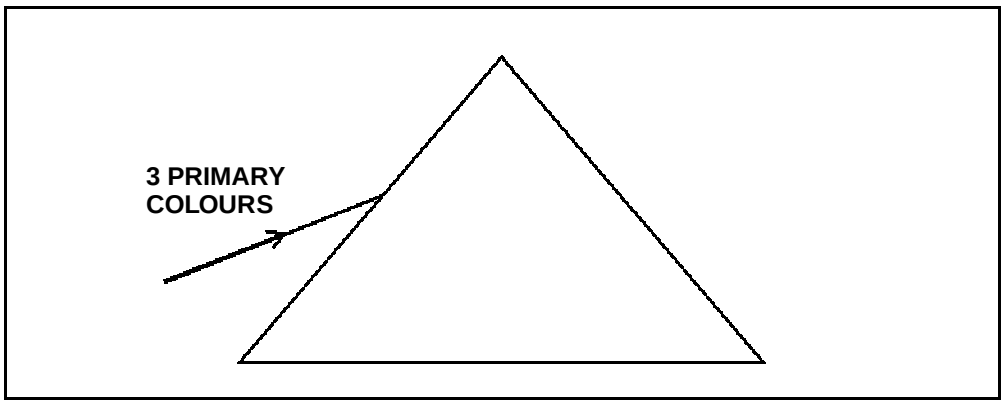
QUESTION 6
LIGHT, COLOUR AND SPECTRA

6.1 Teddy shines the three primary colours simultaneously at an angle onto an even-sided prism.



6.1.1 What happens to the primary colours as they enter the prism? (1)

6.1.2 What is the phenomenon being observed? (2)

6.1.3 Which type of spectrum does he observe? (2)

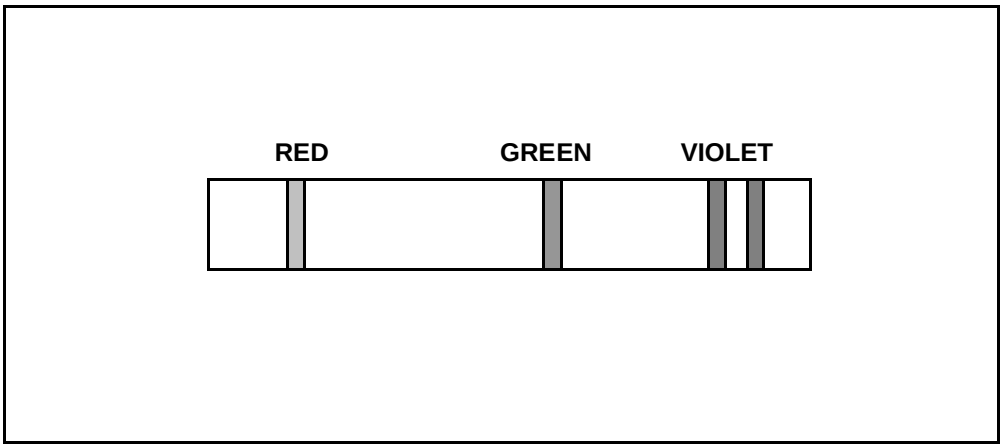
6.1.4 Which colour of this spectrum has the highest frequency? (2)

6.1.5 Which primary colour is refracted the least? (2)

6.1.6 What will happen with monochromatic yellow light when it is shone onto a prism in the same way? (2)

6.1.7 What would be observed if the three primary colours were together shone through a diffraction grating? (2)

6.2 When light, that is emitted by a lithium discharge tube, is viewed through a spectroscope, the following spectrum is observed as shown below.



6.2.1 What is this type of spectrum called? (2)

6.2.2 What causes these colour stripes in this spectrum? (4)

6.2.3 Name ONE application of this principle demonstrated above. (2)

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TOTAL: 150

PHYSICS INFORMATION SHEET/ *FISIKA-INLIGTINGSBLAD*

EQUATIONS / *VERGELYKINGS*

WAVES / *GOLWE*	ELECTRICITY / *ELEKTRISITEIT*
$v = f\lambda$	$R = r_1 + r_2 + r_3$
$f = \frac{1}{T}$	$\frac{1}{R} = \frac{1}{r_1} + \frac{1}{r_2} + \frac{1}{r_3}$
	$V_p I_p = V_s I_s$
	$\frac{V_s}{V_p} = \frac{N_s}{N_p}$

PHYSICS CONSTANTS / *FISIKA-KONSTANTES*

Miscellaneous constants (Approximate values) *Diverse konstantes (Benaderde waardes)*

NAME/*NAAM*	SYMBOL/*SIMBOOL*	VALUE/*WAARDE*
Speed of light *Spoed van lig*	c	$3,0 \times 10^8 \times m.s^{-1}$
Charge on electron *Lading op elektron*	e^-	$-1,6 \times 10^{-19}$ C

END / *EINDE*