SENIOR CERTIFICATE EXAMINATION

FEBRUARY / MARCH

2007

FUNCTIONAL PHYSICAL SCIENCE

SG

First Paper
Physics

305-2/1 E

12 pages

305 2 1E SG

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 parallel connection, _____ .

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

1.2 According to Ohm's law _____ .

A. the ratio of potential difference to current strength represents the resistance of a conductor
B. the direction of the induction current is such that forces are generated resisting the change of magnetic flux
C. the magnitude of the emf or current is determined by the tempo of the flux change through the conductor
D. a current-bearing conductor in a magnetic field experiences a force in a direction according to the left-hand rule

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

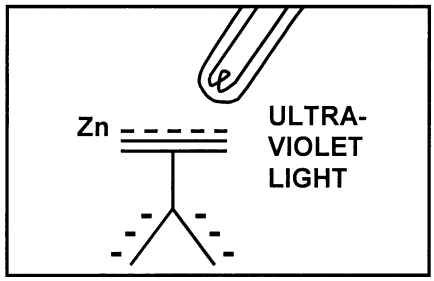
A. Red
B. Violet
C. Green
D. Yellow

1.4 Gamma, ultraviolet, infra-red rays, radio and soundwaves undergo _____ .

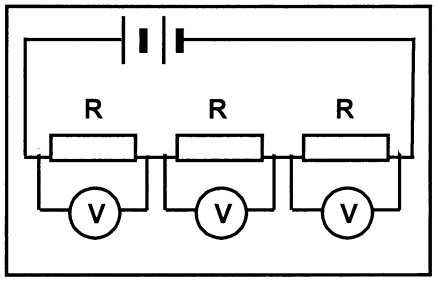
A. refraction, reflection and polarisation
B. refraction, diffraction, reflection and polarisation
C. reflection, refraction, diffraction and interference
D. reflection, refraction, polarisation and interference

1.5 Which diagram illustrates potential division?

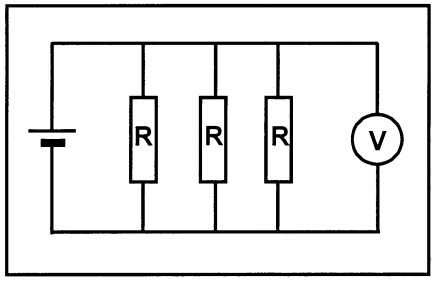
A.



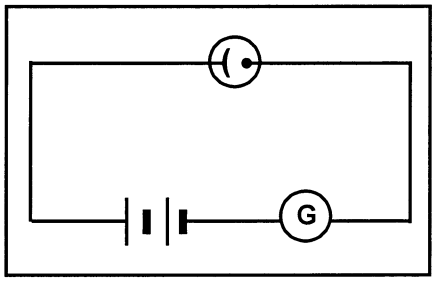
B.



C.



D.



1.6 The degree of magnetisation of the electromagnet's core to saturation is dependant on the _____ .

A. number of turns in the solenoid
B. current strength through the turns
C. kind of core material
D. thickness of the windings

1.7 Which one of the following combinations of components serve as a switch and amplifier in an electrical circuit?

A. A resistor, transformer and a relay
B. A transistor, transformer and a relay
C. A capacitor, transformer and a diode
D. A diode, capacitor and a transistor

1.8 A pure colour possessing only one frequency and which cannot undergo any more dispersion, is called _____ .

A. monochromatic light
B. a line spectrum
C. white light
D. a photon

1.9 The frequency of light is best associated in terms of the light's _____ .

A. intensity and wavelength
B. colour and energy
C. period and amplitude
D. energy levels

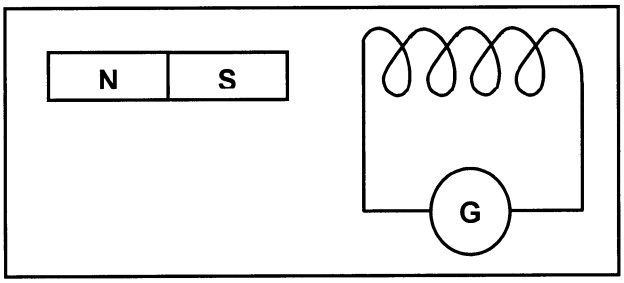
1.10 Linespectra are _____ .

A. obtained when monochromatic green light shines through a prism
B. proof of the electromagnetic nature of light
C. evidence of the existence of energy levels in an atom
D. obtained when red light is diffracted through a single slit

1.11 The newest Xenon car headlights' characteristic colour is a result of _____ .

A. internal diffraction
B. metal salts' flame colours
C. refraction
D. the ionization of a gas

1.12 The phenomenon where the south pole of the bar magnet experiences an opposing force as it is moved forward and backwards through a coil, can be explained by _____ .



A. the right-hand dynamo rule
B. Ohm's law
C. the left-land motor rule
D. Lenz's law

1.13 Red light is diffracted more than blue light, because red light _____ .

A. has a longer wavelength than blue light
B. has a higher frequency than blue light
C. has the same wavelength as blue light
D. has a lower intensity than blue light

1.14 Dave shines a ray of sunlight through an even-sided prism. What will be observed on the other side of the prism?

A. A line spectrum
B. A spectrum of three colours
C. A refracted beam of white light
D. A continuous spectrum

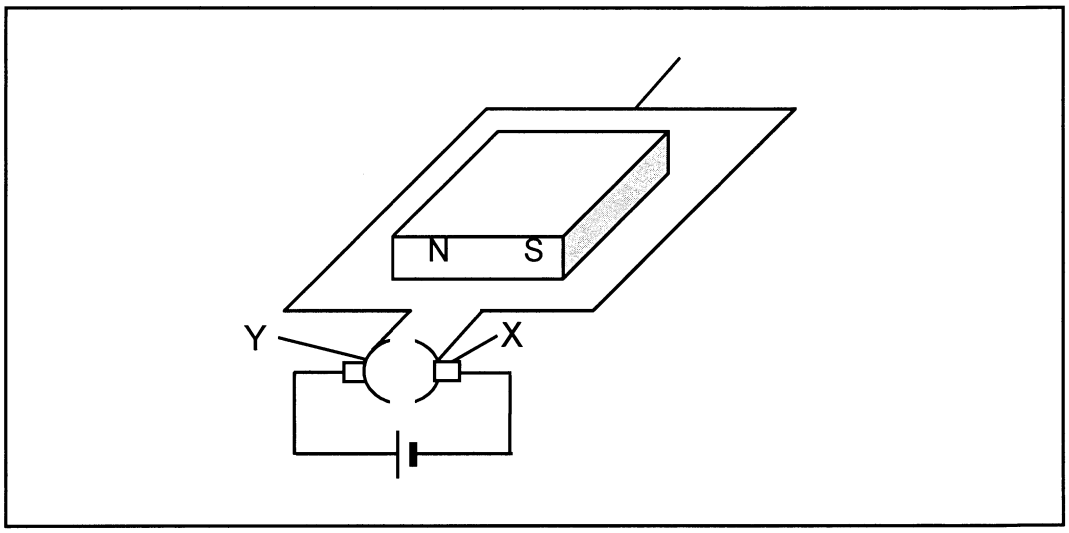
1.15 Which atom particles move the easiest from the negative to the positive pole of the battery through the circuit?

A. Positive protons
B. Free electrons
C. Excess neutrons
D. Negative ions

15x3=**[45]**

QUESTION 2
FORCE ON A CONDUCTOR

2.1 A science educator constructs the following set-up as indicated in the sketch below.



2.1.1 In which direction will the conventional current flow through the loop (clockwise or anticlockwise)? (2)

2.1.2 Name and define the principle demonstrated above. (4)

2.1.3 By which rule will you determine the direction of the current-bearing conductor rotation? (2)

2.1.4 In which direction will the current-bearing conductor rotate? (2)

2.1.5 Name TWO other applications of this principle in practice. (4)

2.1.6 Name THREE ways to enlarge this effect. (6)

2.2 Name the apparatus at

2.2.1 **X** and (2)

2.2.2 **Y**. (2)

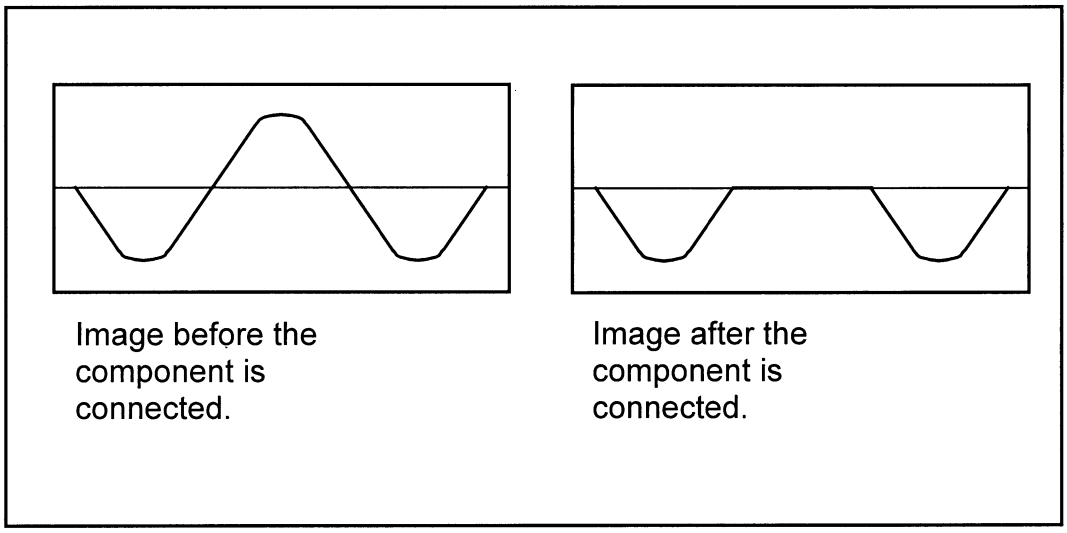
2.3 What is the purpose of **Y**? (3)

[27]

QUESTION 3
ELECTRONICS

3.1 Explain the difference between **alternating current** and **direct current**. (4)

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



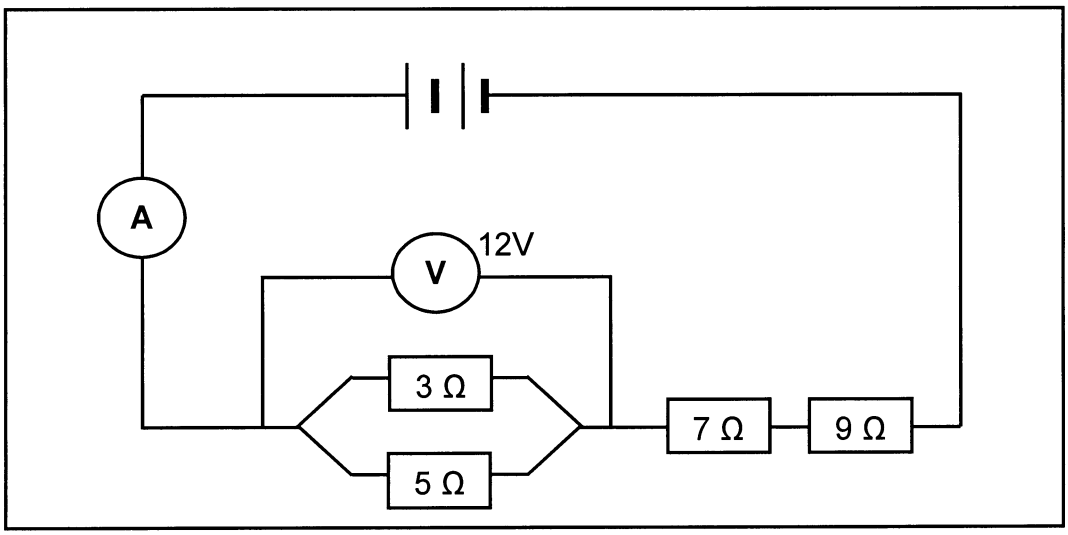
3.2.1 Which component is connected to the circuit? (2)

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

3.2.3 Draw a labelled sketch of a transistor circuit symbol. (4)
[12]

QUESTION 4
OHM'S LAW

4.1 Dawie constructs the following circuit to demonstrate a number of electrical principles.



4.1.1 Is the resistance of the ammeter high or low? Explain. (2)

4.1.2 Would you expect the resistance of a voltmeter to be high or low compared to an ammeter? (2)

4.2 Calculate the total resistance in the circuit. (6)

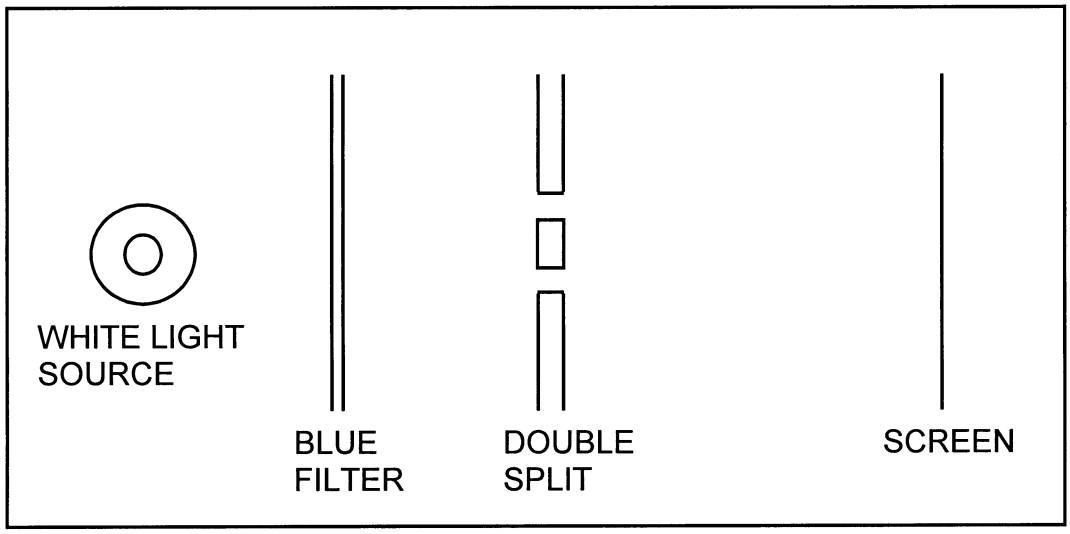
4.3 Calculate the reading on the ammeter. (4)

4.4 What will happen with the reading on the ammeter if the 3Ω resistor is removed from the circuit? (2)

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

QUESTION 5
WAVES

Annelle places a blue filter in front of a white light source as indicated in the sketch below.



5.1 What would be observed on the screen? (2)

5.2 Explain your answer to Question 5.1. (2)

5.3 What would be observed when the white light source is moved further away? (2)

5.4 What would you observe when the blue filter is replaced with a red filter? (2)

5.5 Explain your answer to Question 5.4. (4)

5.6 The distance between the slits is increased while the red filter stays in place. What will you observe on the screen? (2)

5.7 Explain your answer to Question 5.6. (4)

5.8 Electromagnetic waves are generated when electric charges are accelerated.

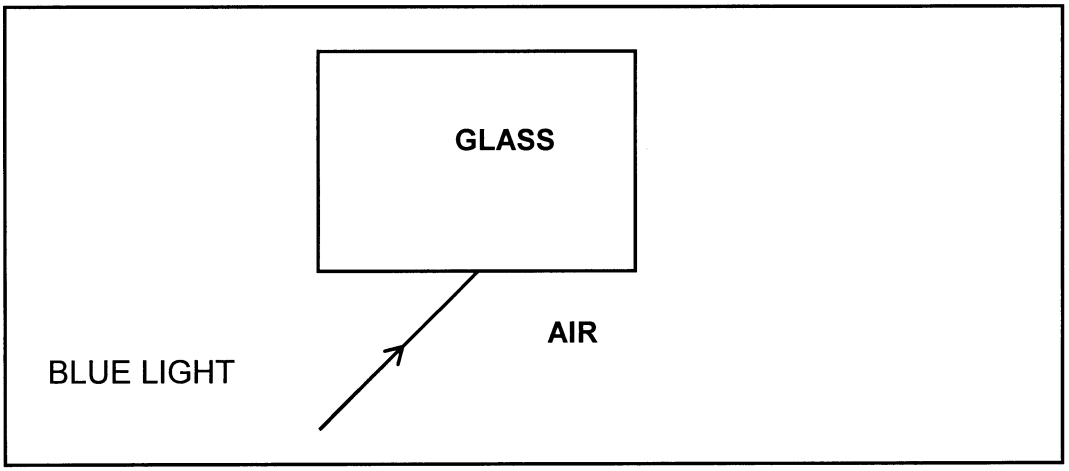
5.8.1 Name TWO types of electromagnetic rays that have a very high penetrating ability. (2)

5.8.2 The period of a certain electromagnetic wave is 4×10^{-15} s.

(a) Determine its frequency. (2)
(b) Determine its wavelength in a vacuum. (4)
[26]

QUESTION 6
LIGHT, COLOUR AND SPECTRA

6.1 Lucille shines a blue monochromatic light beam at an angle onto a glass block.



6.1.1 Name THREE characteristics of the light that change as a result of refraction. (4)

6.1.2 Redraw the diagram in your answer book and complete the path of the light ray as it passes through and out of the glass block. (4)

6.1.3 What name is given to this phenomenon? (2)

6.2 Danie burns the metal salts NaCl and KCl in succession in a flame during an experiment in the laboratory. He views the flame of each salt through a spectroscope and sees a spectrum.

6.2.1 How will you indicate that this light is not monochromatic? (2)

6.2.2 Which type of spectrum does Danie observe? (1)

6.2.3 What causes the coloured lines? (4)

6.2.4 Are the spectra of the two metal salts identical? (1)

6.2.5 Name an application of the principle demonstrated above. (2)
[20]

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*