GAUTENG DEPARTMENT OF EDUCATION
SENIOR CERTIFICATE EXAMINATION

FEB / MAR 2006

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 by making a cross (**X**) over the letter A, B, C or D on the **answer sheet** on the **inside cover** of your a**nswer book** to show which letter you have chosen.
- Answer ALL other questions in the **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. Choose the letter which in your opinion represents the correct answer and draw 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

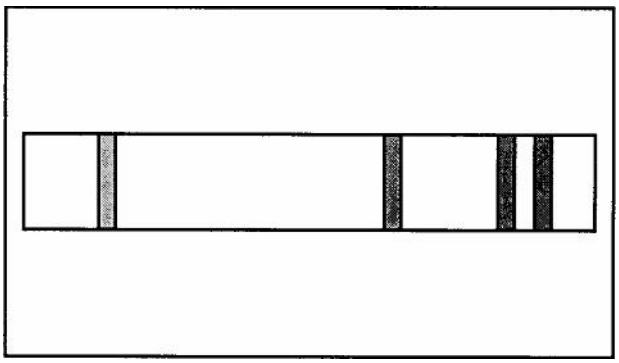
ANSWER:

A	B	C	D

1.1 An electromagnet can be changed into a permanent magnet by _____ .

A. increasing the current strength
B. increasing the number of turns
C. changing the direction of the current
D. changing the type of core

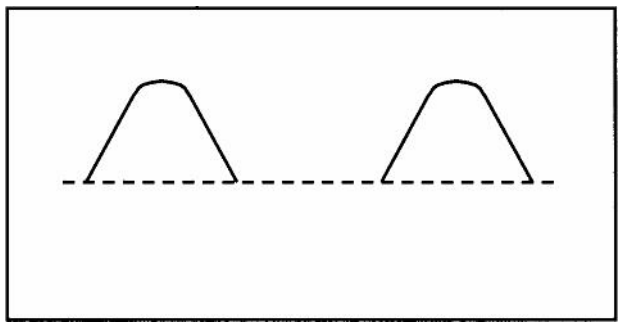
1.2



This diagram, consisting of a number of coloured lines, represents _____ .

A. the line spectrum of hydrogen
B. the continuous spectrum of the sun
C. the photo-electric effect
D. the continuous spectrum of white light

1.3 The following pattern of an electric current is formed on the screen of an oscilloscope. This represents _____.



A. alternating current as produced by an alternating-current dynamo
B. alternating current after it has been rectified by a diode
C. direct current as produced by a battery
D. direct current as produced by a direct-current dynamo

1.4 The colour and energy of light is best described in terms of the _____ of the light.

A. amplitude
B. wavelength
C. velocity
D. frequency

1.5 In the transformer _____ .

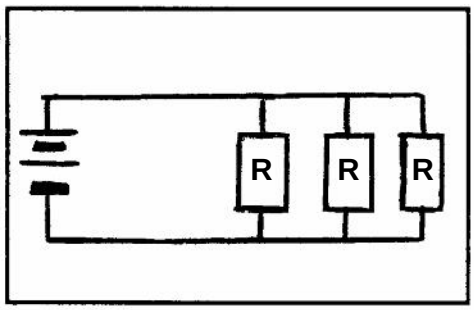
A. thermionic emission takes place
B. the current strength is increased or decreased
C. electrical energy is generated or destroyed
D. direct current is changed to alternating current

1.6 Electromagnetic waves, like radio waves, _____ .

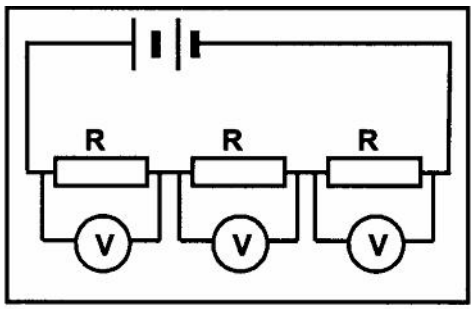
A. cannot be transmitted through a vacuum
B. move at 340 m/s through air
C. consist of electromagnetic disturbances
D. are longitudinal waves

1.7 Which diagram illustrates the division of potential?

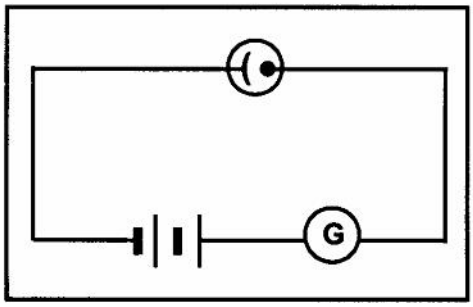
A.



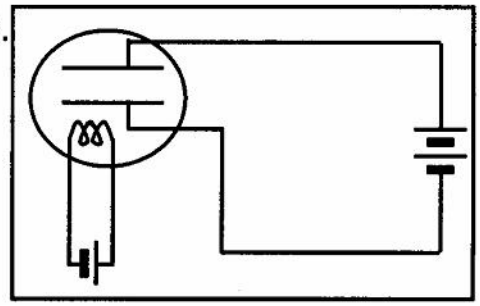
B.



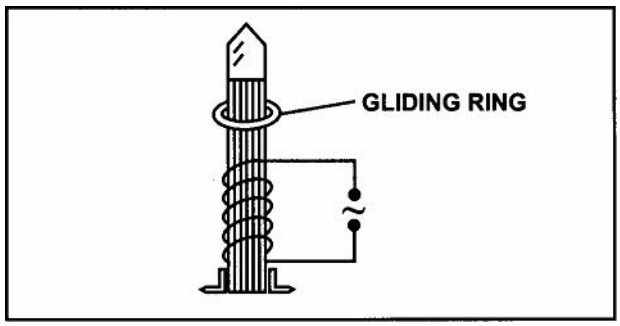
C.



D.



1.8 The diagram represents a transformer which _____ .



A. increases potential difference
B. decreases potential difference
C. decreases current strength
D. changes alternating current into direct current

1.9 Which one of the following cannot be explained by the wave model of light?

A. Photo-electric effect
B. Polarisation
C. Interference
D. Refraction

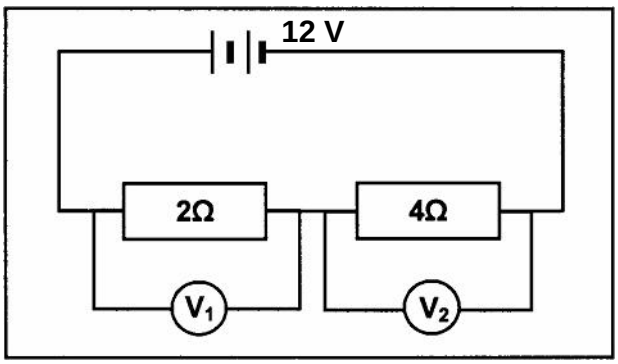
1.10 A certain wave has a period of 0,2 s and a wavelength of 3 m. The speed of this wave in m/s is _____ .

A. 0,07
B. 0,6
C. 5
D. 15

1.11 Waves of a certain frequency enter a different medium where the wave velocity is higher. Which of the following statements about the frequency and wavelength in the new medium is correct?

A. The wavelength remains the same but the frequency decreases.
B. The wavelength remains the same but the frequency increases.
C. The frequency remains the same but the wavelength increases.
D. The frequency remains the same but the wavelength decreases.

1.12 Observe the following circuit.



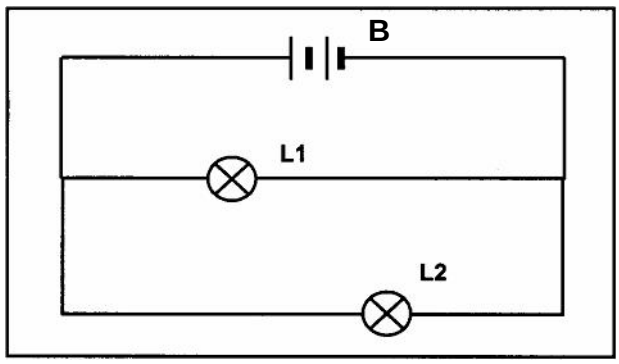
The reading on voltmeters V_1 and V_2 are, respectively

	V_1	V_2
A.	2V	4V
B.	4V	2V
C.	4V	8V
D.	8V	4V

1.13 The phenomenon common in both electromagnetic atoms and alternating current, is _____ .

A. accelerating charges
B. accelerating magnetic fields
C. accelerating water particles
D. accelerating electric fields

1.14 In the following diagram **L1** and **L2** are two light bulbs and **B** is a battery of negligible internal resistance.



If Ronel disconnects bulb **L2** from the circuit, then **L1** will _____ .

A. not glow at all
B. glow dimmer than before
C. glow brighter than before
D. glow brightly as before

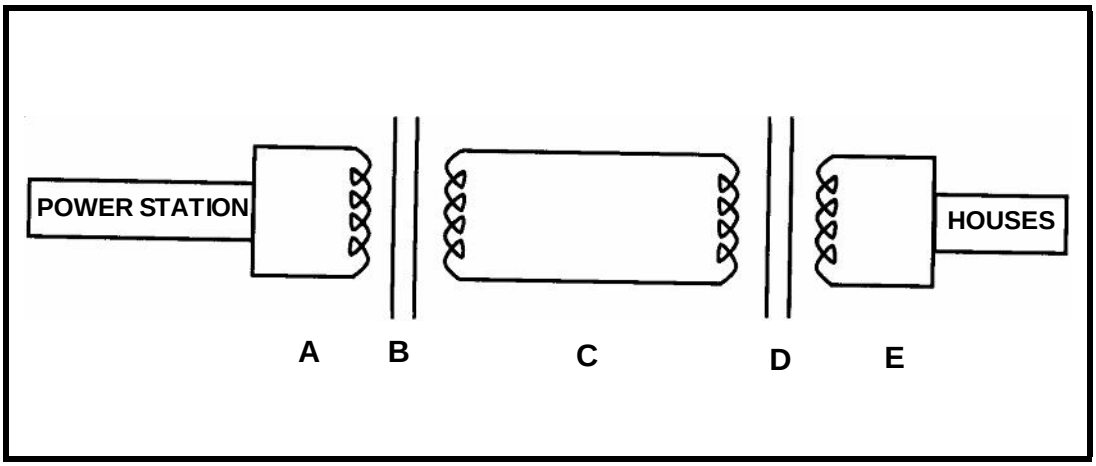
1.15 When the line spectrum of a certain element is observed through a diffraction grating, the _____ line is seen furthest from the central bright line.

A. red
B. violet
C. green
D. blue

15x3=**[45]**

QUESTION 2
ELECTRICITY

2.1 When electricity is transmitted over long distances, alternating-current networks are mainly used. Study the following simplified diagram of such a network and answer the questions by writing down only the correct answer.



2.1.1 Alternating / direct current / high / low voltage is generated at the power station. (2)

2.1.2 **B** represents a dynamo / step-up transformer / step-down transformer. (2)

2.1.3 The transmission wires at **C** carry high / low voltage alternating / direct current. (2)

2.1.4 **D** represents a step-down transformer / step-up transformer. (2)

2.1.5 The current is lowest at **A** / **C** / **E**. (2)

2.1.6 The voltage is highest at **A** / **C** / **E**. (2)

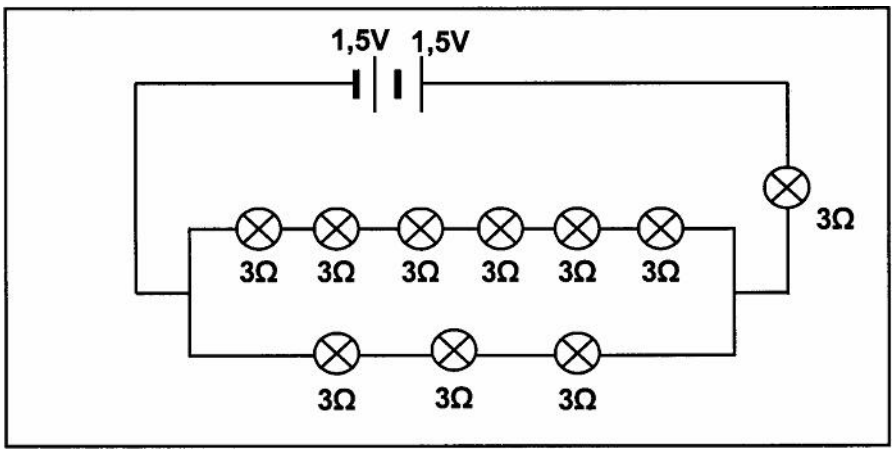
2.2 What is the advantage of using alternating current over direct current for transmission of electrical power? (2)

2.3 Explain why laminated iron cores are used in parts **B** and **D**. (4)

[18]

QUESTION 3
OHM'S LAW

3.1 Zanda built an electrical circuit with components he found in the Science storeroom. He found ten torch globes with a resistance of 3 O each. Zanda also found two torch batteries, a multimeter and a switch. He connected the components as in the circuit below.



3.1.1 What is the magnitude of the emf of the battery? (2)

3.1.2 Calculate the effective resistance of the resistors in parallel. (6)

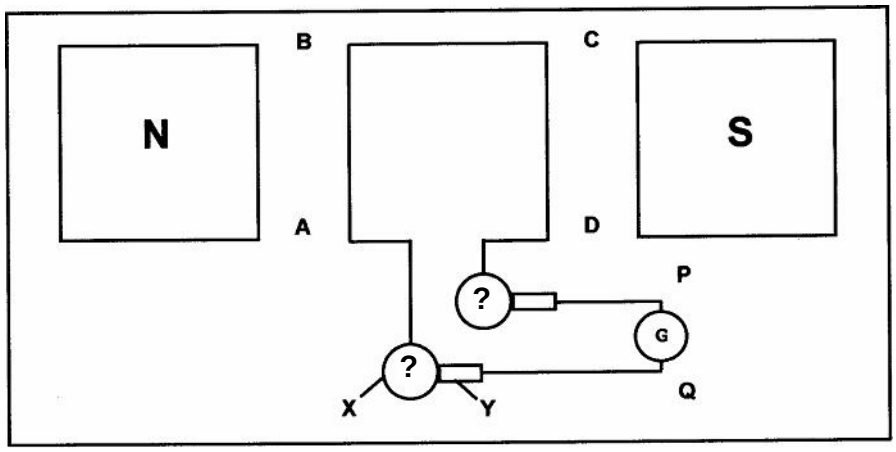
3.1.3 Calculate the total resistance in the circuit. (2)

3.1.4 Zanda connects the multimeter in series with the battery and adjusts the multimeter to read "amps". Calculate the reading on the meter. (4)

3.1.5 Zanda connects the multimeter in parallel over the resistors and adjusts the multimeter to read "volts". Calculate the reading on the meter. (4)
[18]

QUESTION 4
MAGNETIC INDUCTION

The following sketch is a simple representation of an alternating-current dynamo.



4.1 Name the following parts:

4.1.1 X (1)

4.1.2 Y (1)

4.2 What will the direction of the **electron current** be through the galvanometer at the moment when conductor **AB** is moved into the page? (From **P** to **Q** or from **Q** to **P**) (2)

4.3 4.3.1 What component would you add to the setup so that direct current is generated? (2)

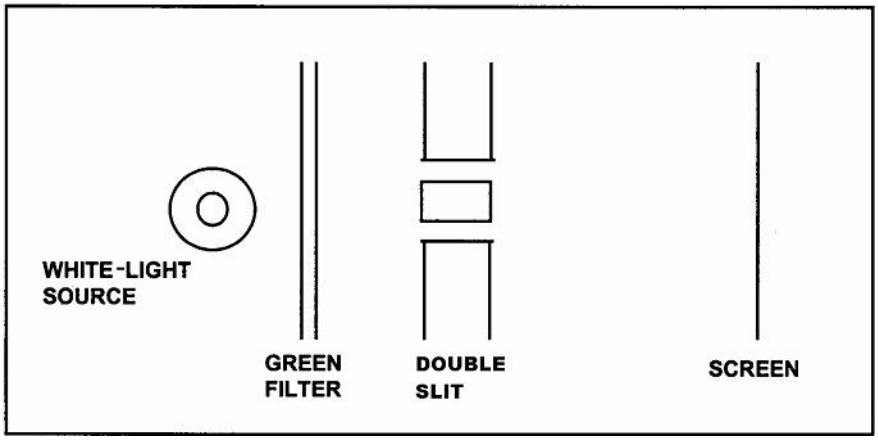
4.3.2 Sketch the symbol for the electronic component for the change in Question 4.3.1. (2)

4.4 Distinguish between **alternating current** and **direct current**. (4)

4.5 Name TWO methods to increase the reading on the galvanometer. (4)
[16]

QUESTION 5
WAVES

5.1 Jenna places a green filter in front of a white-light source as shown in the sketch.



5.1.1 What is observed on the screen? (2)

5.1.2 Explain your answer to Question 5.1.1. (4)

5.1.3 What will be observed when the white-light source is moved further away? (2)

5.1.4 What will be observed if the green filter is replaced by a red filter? (2)

5.1.5 Explain your answer to Question 5.1.4. (4)

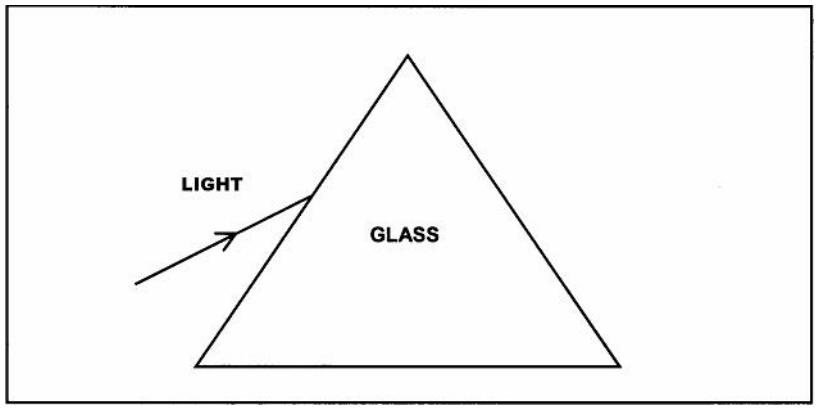
5.1.6 The distance between the slits is increased while the red filter is kept in place. What will you now observe on the screen? (2)

5.1.7 Explain your answer to Question 5.1.6. (2)

[18]

QUESTION 6
LIGHT, COLOUR AND SPECTRA

6.1 Rona shines a blue monochromatic light beam at an angle onto an equilateral prism.



6.1.1 Name THREE changes that can occur to a light ray after striking the glass prism. (6)

6.1.2 Indicate whether each of the following will increase, decrease or remain the same when the light enters the glass. Write only INCREASE, DECREASE or REMAINS THE SAME.

A. Wavelength
B. Frequency
C. Colour
D. Speed 4x1=(4)

6.2 Consider the following electromagnetic waves: radio waves, infra-red waves, X-rays and ultra-violet rays.

6.2.1 Which one has the longest wavelength? (2)

6.2.2 Which one has the highest frequency? (2)

6.3 Dave burns the metal salts NaCl and KCl successively in a flame during an experiment in the laboratory and looks at the flame of each salt successively through a spectroscope and sees a spectrum.

6.3.1 What kind of spectrum does Dave observe? (2)

6.3.2 What causes the coloured lines? (3)

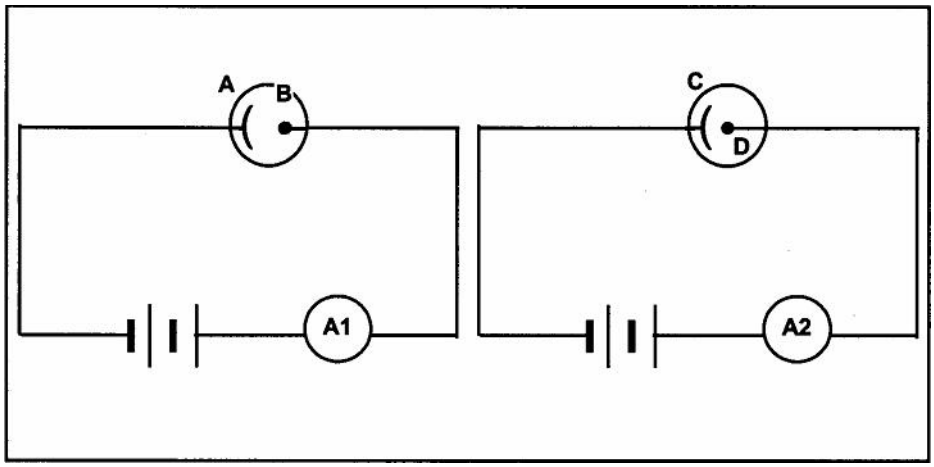
6.3.3 Are the spectra of the two metal salts identical? (1)

6.3.4 Name an application of the principle which is demonstrated above. (2)

[22]

QUESTION 7
ELECTRONS IN THE ATOM

7.1 The diagram shows two different photo-cells connected to identical cells.



7.1.1 Which TWO letters indicate the cathodes of the respective photo-cells? (2)

7.1.2 Both cathodes are irradiated with red light of the same frequency from a 20 W lamp. A reading is recorded on micro-ammeter **A1** but not on micro-ammeter **A2**. Explain how this is possible. (2)

7.1.3 How will the readings on **A1** and **A2** be affected if the 20 W red lamp is replaced with a similar red lamp of 100 W? Explain your answer. (4)

7.2 Name **another** THREE methods whereby electrons can be removed from an atom. (3)

7.3 Name one application of a photo-electric cell. (2)
[13]

TOTAL: 150