



# NOVEMBER EXAMINATION QUESTION PAPER COVER SHEET

Name:		Gr.	10
Subject:	Physical Sciences	Marks:	125
Educator:	Mr De Villiers & Ms Bouwer	Date:	12 Nov 2015
Moderator:	Mr De Villiers	Time:	2 hours
Paper No.:	Physical Sciences Paper 1		
Venue:	1, 2 and 3		
Session:	Session 1		

*Paper consists of 8 Questions and 9 Pages.*

### Instructions:

1. Answer ALL the questions.
2. Non-programmable calculators may be used.
3. Appropriate mathematical instruments may be used.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Data sheets are attached for your use.
6. Give brief motivations, discussions, etc. where required.

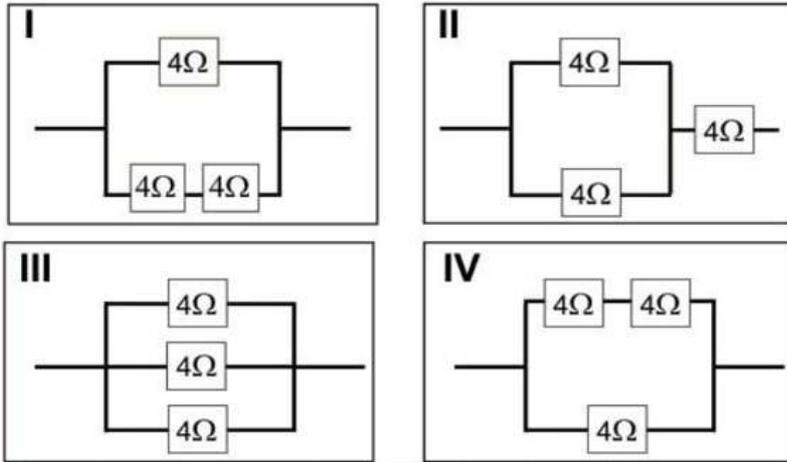
## SECTION A

## QUESTION 1: MULTIPLE CHOICE

Each question only has ONE correct answer. Write only the letter (A-D) next to the question number (1.1 – 1.10) in the ANSWER BOOK.

1.1

Three identical resistors of  $4\ \Omega$  are connected to give a combined resistance of  $6\ \Omega$ . Which of the following circuit diagrams illustrates how this was done?



- A. I
- B. II
- C. III
- D. IIII

(2)

1.2

Which of the following is not a SCALAR quantity?

- A. Time
- B. Energy
- C. Acceleration
- D. Mass

(2)

1.3

A girl runs once around a circular track with a circumference of  $400\ \text{m}$  at a constant speed of  $2\ \text{m}\cdot\text{s}^{-1}$ . Her displacement is:

- A. 0
- B.  $400\ \text{m}$  West
- C.  $400\ \text{m}$  East
- D.  $130\ \text{m}$

(2)

1.4

Sound will be best transmitted by...

- A. air
- B. water
- C. iron
- D. vacuum

(2)

1.5

A man walks 30 m North and then 40 m South. His resultant distance is...

- A. 50 m North
- B. 50 m
- C. 70 m
- D. 10 m South

(2)

1.6

Acceleration is

- A. the slope of a displacement-time graph.
- B. the rate of change of velocity.
- C. a scalar.
- D. the rate of change of displacement.

(2)

1.7

The variable that is expected to change because of another variable is known as the

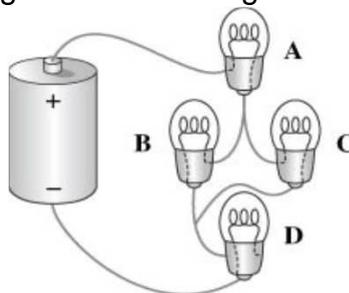
- A. directly proportional variable.
- B. independent variable.
- C. controlled variable.
- D. dependent variable

(2)

1.8

Rank the identical bulbs in the following circuit according to their brightness, from brightest to dimmest.

- A.  $A > B = C > D$
- B.  $A = B = C = D$
- C.  $A = D > B = C$
- D.  $B = C > A > D$



(2)

1.9

A wave that consists of two perpendicular transverse waves with one component of the wave being a vibrating electric field and the other being a corresponding magnetic field is called a(n):

- A. induction wave.
- B. radiant wave.
- C. sound wave
- D. electromagnetic wave

(2)

1.10

The following are electromagnetic waves except

- A. infrared waves
- B. gamma waves
- C. sound waves
- D. radio waves

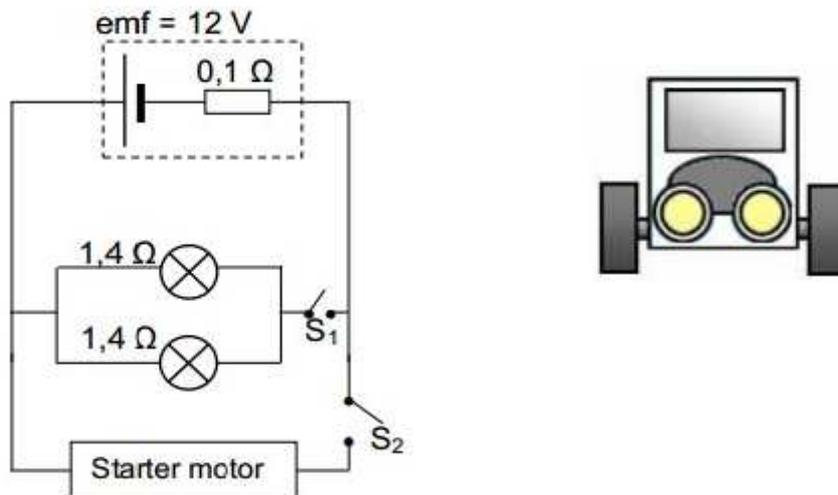
(2)

**[20]**

## SECTION B

## QUESTION 2: ELECTRICITY

The headlights of a car are connected in parallel to a 12V battery, as shown in the simplified circuit diagram below. The internal resistance of the battery is  $0,1\Omega$  and each headlight has a resistance of  $1,4\Omega$ . The starter motor is connected in parallel with the headlights and controlled by the ignition switch,  $S_2$ . The resistance of the connecting wires **may be ignored**.



2.1 State Ohm's law in words. (2)

With only switch  $S_1$  closed, calculate the following:

2.2 Effective resistance of the two headlights. (3)

2.3 The current flowing through the battery. (3)

2.4 The potential difference across each headlight. (2)

2.5 Power dissipated by one of the headlights. (3)

2.6 Ignition switch  $S_2$  is now closed (whilst  $S_1$  is also closed) for a short time and the starter motor, with VERY LOW RESISTANCE, rotates.

2.6.1 How will the brightness of the headlights be affected while switch  $S_2$  is closed? Write down only INCREASES, DECREASES or REMAINS THE SAME. (1)

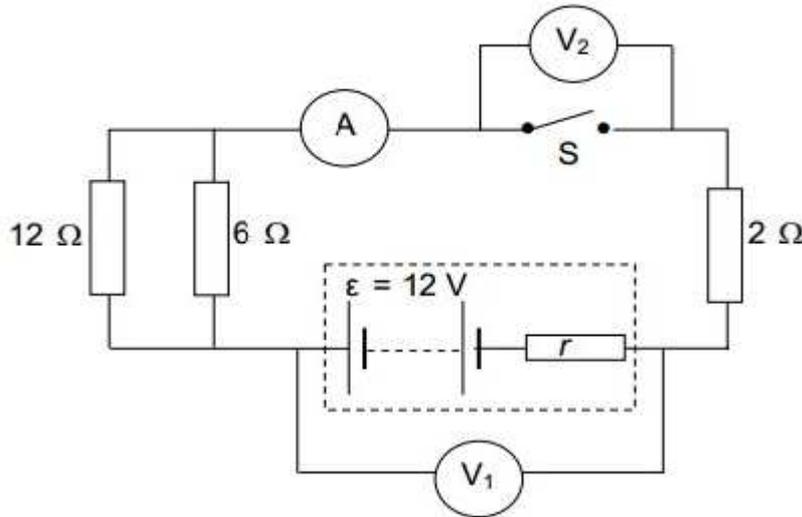
2.6.2 Briefly explain how you arrived at the answer. (2)

2.7 Each light bulb of the headlights have a power of 40W and are switched on for 10 seconds. If 200 Jules of USEFUL energy is transferred, what is the efficiency of the lightbulb? (2)

[18]

**QUESTION 3: INTERNAL RESISTANCE**

The battery in the circuit diagram below has an EMF of 12V and an unknown internal resistance  $r$ . Voltmeter  $V_1$  is connected across the battery and voltmeter  $V_2$  is connected across the switch  $S$ . The resistance of the connecting wires and the ammeter is negligible.



3.1 Write down the respective readings on voltmeters  $V_1$  and  $V_2$  when switch  $S$  is open. (2)

**Switch  $S$  is now closed.** The reading on voltmeter  $V_1$  changes to 9V.  
The ammeter reading is 1,5 A.

- 3.2 Calculate the total external resistance of the circuit. (3)  
 3.3 Calculate the internal resistance,  $r$ , of the battery. (4)  
 3.4 Calculate the current through the  $6 \Omega$  resistor. (4)

**[13]**

**QUESTION 4: MOTION IN ONE DIMENSION**

- 4.1 A plane requires a speed of  $60 \text{ m.s}^{-1}$  before it can take off. It accelerates uniformly from rest at the end of the runway, with length 600 m. During the first 5 seconds of its take-off the plane covers a distance of 78 m.



- 4.1.1 Define acceleration. (2)
- 4.1.2 Calculate the magnitude of the acceleration of the airplane for the first 5 s. (4)
- 4.1.3 Calculate the length of the runway that is **not** used during the take-off. (3)

- 4.2 A hot air balloon is moving upwards at a constant velocity of  $8 \text{ m.s}^{-1}$ . At a height of 120 m above the ground, a boy on the balloon, drops a tennis ball. Ignore air resistance.



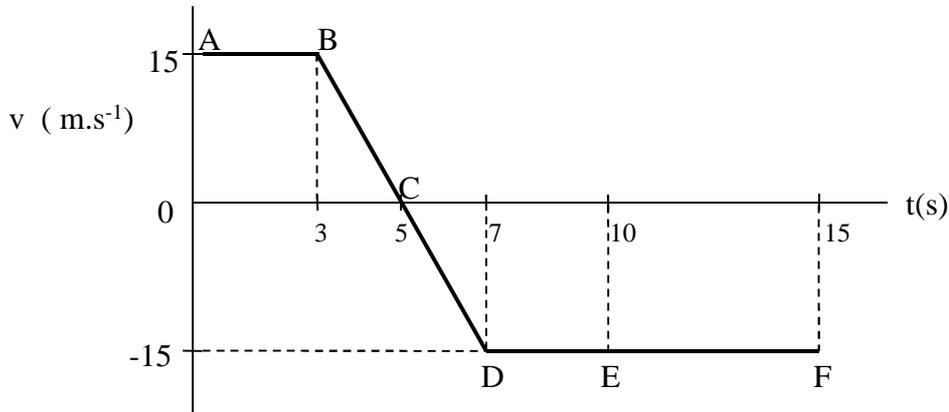
↑  $8 \text{ m.s}^{-1}$

- 4.2.1 Calculate the time taken for the ball to reach its highest point above the ground. (4)
- 4.2.2 Calculate the velocity of the ball when it hits the ground. (4)
- 4.2.3 The time it takes for the ball to hit the ground after being dropped is 5.83 s. Determine the height of the balloon above the ground at the moment that the ball hits the ground. (2)

**[19]**

**QUESTION 5: DESCRIPTION OF MOTION**

The diagram below shows a velocity- time graph for a truck moving in a straight line, initially **eastwards**:



5.1 Describe the type of motion in each of the following cases:

5.1.1 AB

(2)

5.1.2 BC

(2)

5.2 Use the graph to determine the acceleration of the truck between C and D.

(3)

5.3 Give the instantaneous velocity of the truck at E.

(2)

5.4 Determine the resultant displacement of the truck after 15s.

(5)

5.5 Determine the average velocity of the truck during the 15s of motion.

(2)

5.6 Sketch a acceleration vs. time graph for the 15s of motion for this truck. All significant values must be included on your graph.

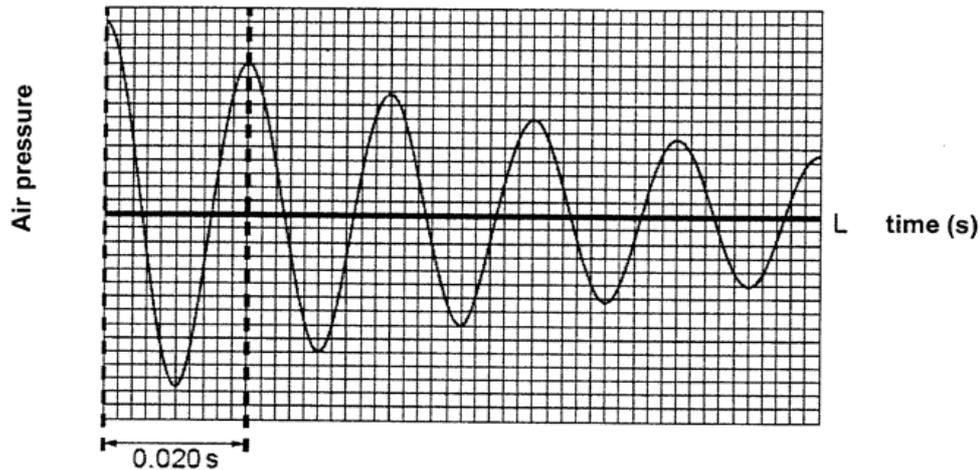
(Significant values are all maximum, minimum and intercept values.)

(5)

**[21]**

**QUESTION 6: WAVES**

A sound from an electronic organ is played into a microphone which is connected to an oscilloscope. The diagram below shows the wave trace (pattern) of the sound produced by the organ. The horizontal line marked L is the trace seen when there is no sound. The time for one complete cycle of the wave is 0,020s.



- 6.1 What is the term for "**time for one complete cycle**"? (1)
- 6.2 Does sound travel by means of a LONGITUDINAL or TRANSVERSE wave? (1)
- 6.3 How does the diagram above indicate that the:
- 6.3.1 loudness of the sound decreases with time? (1)
- 6.3.2 pitch of sound is constant? (1)
- 6.4 Calculate the:
- 6.4.1 Frequency of the wave. (2)
- 6.4.2 Wavelength of the wave if the speed of sound in air is  $340 \text{ m}\cdot\text{s}^{-1}$ . (3)

**[9]**

**QUESTION 7: ELECTROMAGNETIC RADIATION**

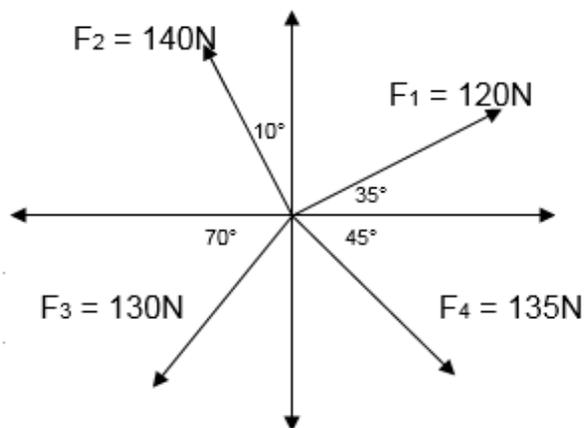
A photon of electromagnetic radiation has a frequency of  $1,5 \times 10^{15}$  Hz.

- 7.1 Calculate the energy of the photon. (4)  
 7.2 Calculate the wavelength of the radiation (4)  
 7.3 State the relationship between wavelength and frequency of electromagnetic radiation in words. (2)  
 7.4 Gamma rays are the most energetic rays in the electromagnetic spectrum. What is the relationship between:  
 7.4.1 the energy and the frequency of the wave? (1)  
 7.4.2 the energy and the wavelength of the wave? (1)

[12]

**QUESTION 8: VECTORS ON A CARTESIAN PLANE**

- 8.1 Use information in the Cartesian Plane below to answer the following questions:  
 8.1.1 Resultant Horizontal Component  $F_{xnet}$  (4)  
 8.1.2 Resultant Vertical Component  $F_{ynet}$  (4)  
 8.1.3 Resultant Force  $F_{net}$  (5)



[13]

**TOTAL .../125**  
**The End ≈ Well Done**