PHSC

ISEBE LEMFUNDO LEMPUMA KOLONI
EASTERN CAPE EDUCATION DEPARTMENT
OOS-KAAP ONDERWYSDEPARTEMENT

IIMVIWO ZEBANGA LESHUMI ELINANYE
GRADE 11 EXAMINATIONS
GRAAD 11-EKSAMEN

NOVEMBER 2008

PHYSICAL SCIENCES – FIRST PAPER (PHYSICS)

IXESHA: 3 iiyure **TIME: 3 hours** **TYD: 3 uur**
AMANQAKU: 150 **MARKS: 150** **PUNTE: 150**

Write on the cover of your answer book, after the word "Subject" –
PHYSICAL SCIENCES – FIRST PAPER

This question paper consists of 12 pages, a 3 page data sheet, an answer sheet and graph paper.

INSTRUCTIONS AND INFORMATION

1. Write your name and/or examination number (and centre number if applicable) in the appropriate spaces on the ANSWER SHEET and ANSWER BOOK.
2. Answer ALL the questions.
3. Answer SECTION A on the attached ANSWER SHEET and place the completed ANSWER SHEET inside your ANSWER BOOK.
4. Answer SECTION B in the ANSWER BOOK.
5. Non-programmable calculators may be used.
6. Appropriate mathematical instruments may be used.
7. Number the questions correctly according to the numbering system used in this question paper.
8. Data sheets are attached for your use.
9. Give brief motivations, discussions, et cetera where required.

SECTION A

Answer this section on the attached ANSWER SHEET.

QUESTION 1: ONE-WORD ITEMS

Give ONE word/term for EACH of the following descriptions. Write only the word/term next to the question number (1.1 – 1.5) on the attached ANSWER SHEET.

1.1 When you lift a brick with your hand, your elbow acts as the ... (1)

1.2 The ability of your eye to adjust its lens automatically is known as ... (1)

1.3 The phenomenon that one vibrating object causes another one to also start vibrating. (1)

1.4 A device used to store charge. (1)

1.5 Amount of current passing through a conductor in one second. (1)
[5]

QUESTION 2: MATCHING ITEMS

Choose an item from COLUMN B that best matches a description in COLUMN A. Write only the letter (A – J) next to the question number (2.1 – 2.5) on the attached ANSWER SHEET.

COLUMN A		COLUMN B	
2.1	Newton's First Law	A.	Wavelength
2.2	The maximum displacement from the equilibrium position.	B.	Potential difference
2.3	p-type semiconductor formed when silicon is doped with ...	C.	Wearing a seatbelt
2.4	The process by which an emf is produced when magnetic flux is cut by a coil of wire	D.	Gallium
2.5	Work done in moving a charge	E.	Electromagnetic radiation
		F.	Electric field strength
		G.	Explains the rowing of a canoe
		H.	Phosphorous
		I.	Electromagnetic induction
		J.	Amplitude

[5]

QUESTION 3: TRUE/ FALSE ITEMS

Indicate whether the following statements are TRUE or FALSE. Write only TRUE or FALSE next to the question number (3.1 – 3.5) on the attached ANSWER SHEET. Correct the statement if it is FALSE.

3.1 Newton's Universal Law of Gravitation only applies to spherical objects. (2)

3.2 Near-sightedness can be corrected by using a converging lens. (2)

3.3 Light, but not sound, can be transmitted through a vacuum. (2)

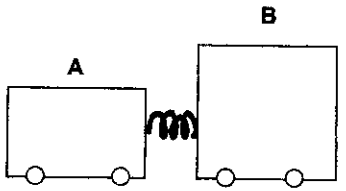
3.4 Faraday's Law explains the force between two charged objects. (2)

3.5 Energy-saving light bulbs of 60 W convert more electrical energy to light energy than conventional 60 W light bulbs. (2)
[10]

QUESTION 4: MULTIPLE-CHOICE QUESTIONS

Four possible options are provided as answers to the following questions. Each question has only ONE correct answer. Choose the correct answer and make a cross (X) in the correct block (A – D) next to the question number (4.1 – 4.5) on the attached ANSWER SHEET.

4.1 Two trolleys, A and B, have a compressed spring between them. The mass of Trolley A is 5 kg and of Trolley B is 8 kg. The trolleys are at rest on a frictionless surface. The spring is released and Trolley A moves to the left with a speed of v.



Trolley B will:

A. move to the right with a speed of ⅝ v.
B. stand still since it is heavier than Trolley A.
C. move to the right with a speed of ⅜ v
D. move to the right with a speed of 2 v (3)

4.2 The loudness of a sound depends on the ...

A. frequency.
B. wavelength.
C. intensity.
D. amplitude. (3)

4.3 Semi-conductors conduct a current through the motion of ...

A. positive ions moving to a negative pole.
B. negative ions moving to a positive pole.
C. delocalised electrons.
D. positive holes and negative electrons. (3)

4.4 When a positive charge moves in the direction of a uniform electric field, the charge ...

A. retains the same electrical potential energy.
B. retains the same kinetic energy.
C. loses electrical potential energy and gains kinetic energy.
D. gains electrical potential energy and loses kinetic energy. (3)

4.5 A device which uses mechanical energy to produce electrical energy is called a ...

A. generator.
B. transformer.
C. capacitor.
D. motor. (3)

[15]

TOTAL SECTION A: 35

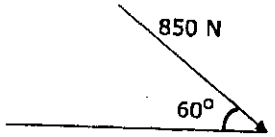
SECTION B

INSTRUCTIONS AND INFORMATION

1. Answer SECTION B in the ANSWER BOOK.
2. The formulae and substitutions must be shown in ALL calculations.
3. Start each question on a new page.
4. Round off your answers to TWO decimal places.

QUESTION 5

An athlete, during his race in the 100 m sprint in the 2008 Beijing Olympics, exerted a force of 850 N on the race track using his shoe on the right foot at an angle of 60° to the horizontal.



5.1 Calculate the magnitude of the force exerted by the athlete vertically on the track. (3)

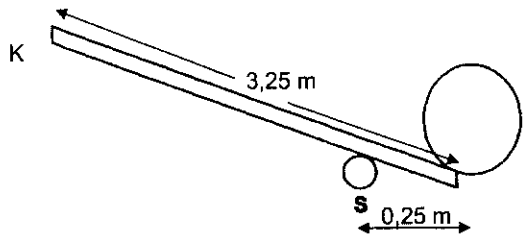
5.2 Calculate the magnitude of the force exerted by the athlete horizontally on the track. (3)

5.3 Determine the minimum value of the coefficient of static friction that the athlete's shoe must have in order to prevent him from slipping. (4)

[10]

QUESTION 6

Amos has to lift a rock, R, of mass 150 kg. He then uses a pole of length 3,25 m to try and lift the rock. He places a smaller stone, S, a distance 0,25 m from the rock as shown in the diagram below.



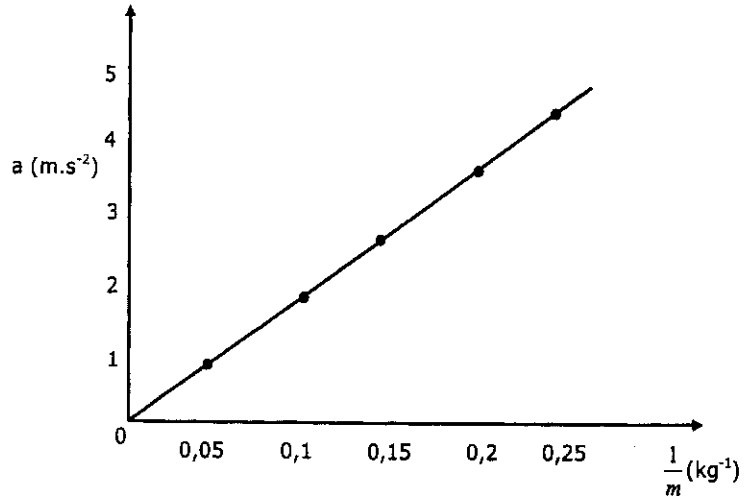
6.1 What class of lever is represented here? (1)

6.2 Determine the mechanical advantage. (4)

6.3 What is the force that Amos must apply to the end of the pole at K in order to lift the rock? (4)
[9]

QUESTION 7

Sinazo and Thandi have to complete an experiment in which they have to study the acceleration of a trolley while a constant force is applied and the mass of the trolley is changed. The result of their experiment is shown in the graph below:



7.1 Which Law of Newton did the learners study? (1)

7.2 What can they conclude from the graph concerning the relationship between acceleration and mass? (2)

7.3 What is the mass of the trolley that was accelerated at 2 $m.s^{-2}$? (2)

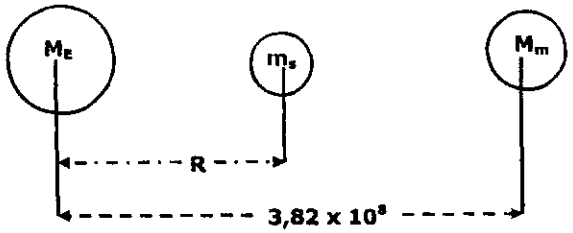
7.4 What is represented by the gradient of the graph? (1)

7.5 Determine the magnitude of the force that was used to accelerate the trolley. (4)

7.6 Draw a sketch graph to indicate the relationship between ACCELERATION and MASS. (No values required) (2)
[12]

QUESTION 8

A spaceship (m_s), mass $3,5 \times 10^4$ kg, is on its way to the moon from the earth. At some point in the flight, the spaceship experiences a ZERO RESULTANT FORCE. (At this specific moment of its journey, the earth, the spaceship and the moon are all in a straight line.) The mass of the earth (M_E) is $6,0 \times 10^{24}$ kg and the mass of Moon (M_m) is $7,36 \times 10^{22}$ kg. The centre of the moon is at a distance of $3,82 \times 10^8$ m from the centre of the earth.



Calculate the distance, R, of the spaceship from the centre of the earth at the moment the spaceship experiences the zero resultant force. **[7]**

QUESTION 9

Two Grade 11 learners, Zuko and Sipho, experimented with convex and concave lenses. They were studying the TYPE OF IMAGES produced by these lenses. They each did five investigations by placing a lit candle at different positions as listed in the table below:

INVESTIGATION	POSITION OF CANDLE
1	Beyond 2F
2	At 2F
3	Between F and 2F
4	At F
5	Between F and lens

9.1 Write down a suitable hypothesis for this investigation. (2)

9.2 With the lens Zuko used, he obtained a virtual image in all his investigations. What type of lens did Zuko use? (2)

9.3 In one investigation, Sipho obtained a real image which was the same size as the object. Which investigation, from the table above, was this? (1)

9.4 What will Sipho observe if the candle is placed at F? (2)

9.5 Use a suitable ray diagram to illustrate the observation in QUESTION 9.4. (2)

9.6 Which investigation can be used to explain how a simple microscope functions? (2)

9.7 What type of lens must a broken bottle be in order to cause a veldfire? (2)
[13]

QUESTION 10

10.1 An object, 20 mm in height, is placed 40 mm from a convex lens. The focal length of the lens is 30 mm.

10.1.1 Draw an accurate diagram to show how the image is formed. (3)

10.1.2 Measure the size of the image. (2)

10.1.3 Calculate the magnification of the lens. (4)

10.2 Use your knowledge of lenses and explain why it is dangerous to look directly at the sun. (2)
[11]

QUESTION 11

Below are the characteristics of two sound waves, X and Y:

Sound wave	Amplitude	Frequency
X	2,8 cm	325 Hz
Y	1,5 cm	168 Hz

11.1 11.1.1 What will happen to the loudness of X if its amplitude decreases? (2)

11.1.2 What will happen to the frequency of Y if its amplitude decreases? (2)

11.2 The captain of a warship uses sonar to determine the position and depth of an enemy submarine from her ship. From the ship's sonar instruments, she emits a pulse and it returns after 12 s. Determine the distance between the warship and the submarine if speed of sound in sea water is 1 522 $m.s^{-1}$. (4)

11.3 People working near jet aircrafts sometimes experience pain in their ears. Explain why they experience the ear pain. Suggest what they can do to prevent ear damage. (3)
[11]

QUESTION 12

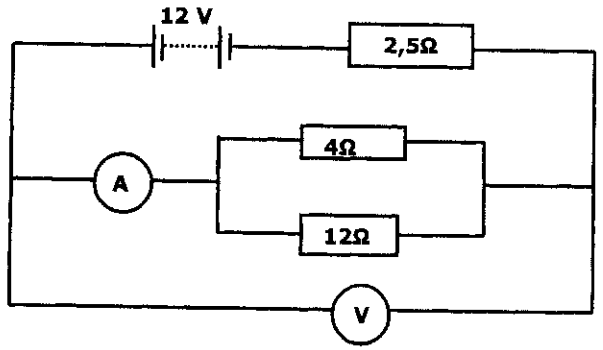
Silicon and germanium belong to a group of materials called semi-conductors. They are used in electronic devices. The band theory of conduction explains how it is possible for metals and semi-conductors to be good conductors of electricity.

12.1 Explain the ability of metals to conduct electricity using the Band theory of conduction. (Use a labelled diagram to explain your answer). (5)

12.2 Semi-conductors become excellent conductors at high temperatures. Give a reason for this phenomenon. (2)
[7]

QUESTION 13

The Circuit diagram below shows a 12 V battery connected to an ammeter, three resistors and a voltmeter as shown below. The internal resistance of the battery is unknown.



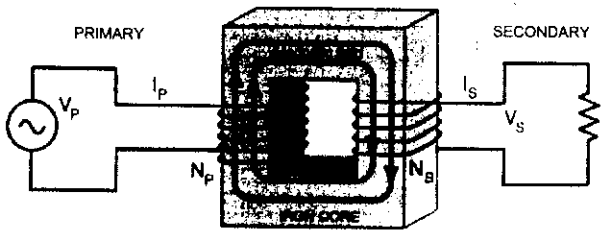
13.1 Calculate the effective resistance of the parallel combination. (4)

13.2 If the reading on the voltmeter is 6 V, calculate the reading on the ammeter. (4)

13.3 Determine the internal resistance of the battery. (5)
[13]

QUESTION 14

Study the diagram of a transformer given below and answer the following questions.



14.1 What type of transformer is represented by this diagram? (1)

14.2 What principle of physics is applied in the design of a transformer? (2)

14.3 What type of current is used in transformers? (**a.c.** or **d.c.**) (1)

14.4 A transformer is required to step down 220 V to 5 V. If the primary coil has 900 turns, how many turns must the secondary coil have? (5)

14.5 Why do you think Eskom's National grid transports electricity at very high voltages? (2)
[11]

QUESTION 15

A group of learners wants to investigate the relation between resistance and the length of the resistance wire. For this activity they are given the following materials:

Ammeter
Voltmeter
Cells
Connecting wires
Rheostat
4 sets of resistance wires of same material, but different lengths
A switch
Graph paper

15.1 Name ONE factor which must be kept constant during the investigation. (1)

15.2 Draw a circuit diagram to explain how you would connect these components to conduct the investigation. (2)

15.3 The following sets of measurements are taken:

	Voltmeter reading (V)	**Ammeter reading (I)**	**Resistance R= V/I (Ω)**	**Length of wire L (cm)**
Wire 1	2,0 V	0, 5 A	**{a}**	12 cm
Wire 2	1,5 V	0,5 A	**{b}**	9 cm
Wire 3	1,0 V	0,5 A	**{c}**	6 cm
Wire 4	0,5 V	0,5 A	**{d}**	3 cm

15.3.1 Complete the RESISTANCE column in the table. (2)

15.3.2 Choose a suitable scale for the axes and draw a graph of resistance (R) (y-axis) and length (L) (x- axis) on the given graph paper.
[PLACE THE GRAPH PAPER IN YOUR ANSWER BOOK] (4)

15.3.3 Write your conclusion from the graph. (2)
[11]

TOTAL SECTION B: 115

GRAND TOTAL: 150