education

Department:
Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 10

PHYSICAL SCIENCES: PHYSICS (P1)

EXEMPLAR PAPER

MARKS: 150

TIME: 3 hours

This question paper consists of 15 pages, an information sheet, an answer sheet and graph paper.

156 1 E

INSTRUCTIONS AND INFORMATION

1. Write your examination (and centre number if applicable) in the appropriate spaces on the ANSWER BOOK.

2. Answer ALL the questions.

3. Answer SECTION A on the ANSWER SHEET provided. Answer SECTION B in your ANSWER BOOK.

4. Non-programmable calculators may be used.

5. Appropriate mathematical instruments may be used.

6. Number the answers correctly according to the numbering system used in this question paper.

7. An information sheet is attached for your use.

8. Wherever motivation, discussion, et cetera is required, be very brief.

SECTION A

Answer this section on the attached ANSWER SHEET.

QUESTION 1: ONE-WORD ANSWERS

Wrie only the correct term for each of the following descriptions next to the question number. In some questions, you may need to choose from the terms given in brackets.

1.1 Displacement per unit time (1)

1.2 Real depth and apparent depth can be explained in terms of this phenomenon (1)

1.3 When light passes from a more optically dense medium into a less optically dense medium it will bend (towards/away from) the normal. (1)

1.4 As the distance between two close charged objects increases, the force (increases/decreases/remains the same). (1)

1.5 A voltmeter is usually connected in (series/parallel) in an electric circuit. (1)
[5]

QUESTION 2: MATCHING ITEMS

Match the information in COLUMN A with an item in COLUMN B by writing only the letter (A - I) next to the question number (2.1 - 2.5).

COLUMN A		COLUMN B	
2.1	Displacement	A	sum of the gravitational potential energy and kinetic energy
2.2	Conservation of energy	B	position where two pulses meet in phase
2.3	Nodes	C	change in position from starting point to ending point in a straight line
2.4	Specular reflection	D	allows electrons to pass through quite easily
2.5	Conductors	E	total path travelled
		F	position where two pulses meet out of phase
		G	energy cannot be created nor destroyed, it is merely converted from one form into another
		H	results in a sharp image
		I	does not allow electrons to pass through easily

[5]

QUESTION 3: TRUE OR FALSE

Indicate whether the following statements are TRUE or FALSE. Write only 'true' or 'false' next to the question number (3.1 - 3.5). Correct the statement if it is FALSE.

3.1 As a ball rolls down a uniform slope, the ball's successive displacement increases in equal time intervals. (2)

3.2 The acceleration of an object moving along a straight line can be determined by calculating the area under a velocity versus time graph. (2)

3.3 The speed of a pulse in a spring depends on the pulse length, tension in the spring and the mass of the spring divided by the length of the spring. (2)

3.4 The poles of a bar magnet, which are located near its ends, are regions where the magnetic effect is the strongest. (2)

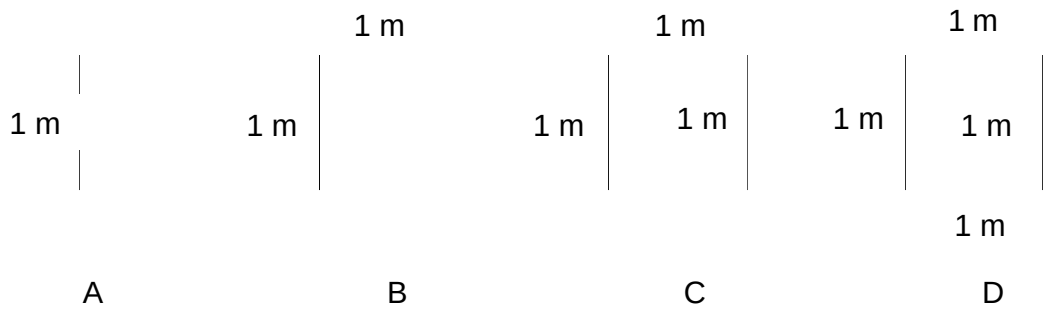
3.5 Electric current is defined as the quantity of charge that passes a given point in a conductor each minute. (2)

[10]

QUESTION 4: MULTIPLE-CHOICE QUESTIONS

Various possible options are given as answers to the following questions. Each question has only ONE correct answer. Choose the answer, which in your opinion is the correct or best one and mark the appropriate block on the answer sheet with a cross (X).

4.1 Which ONE of the following displacement vector diagrams will have the greatest resultant?



(3)

4.2 Two metal objects, having different masses, are dropped from the same height above the floor. Ignore the effects of air resistance. When they are 0,8 m above the ground, they will both have the same ...

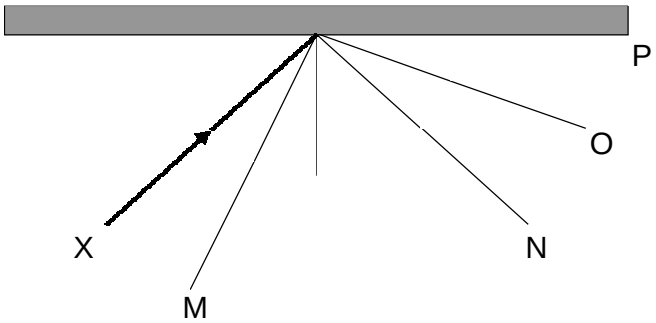
A acceleration.
B weight.
C kinetic energy.
D gravitational potential energy. (3)

4.3 The diagram below shows two points X and Y on a wave train.

How many wavelengths separate point X and Y?

A 0,75
B 1
C 1,5
D 3 (3)

4.4 The diagram shows the path of a light ray, X, directed at a plane mirror.



The correct reflected ray is ...

A M
B N
C O
D P (3)

4.5 Consider the following statements concerning magnetic fields:

(i) The direction of magnetic field lines is from north to south.
(ii) The strength of the magnetic field is indicated by the closeness of the field lines.
(iii) The magnetic field of a bar magnet is weaker near its poles.

Which of the above statements are CORRECT?

A (i), (ii) and (iii)
B (i) and (ii)
C (i) and (iii)
D (ii) and (iii) (3)

[15]

TOTAL SECTION A: 35

SECTION B

INSTRUCTIONS

1. Answer this section in your ANSWER BOOK.

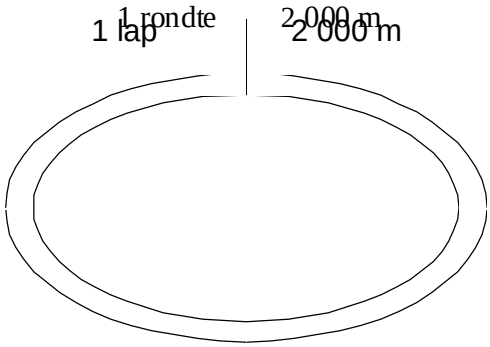
2. In ALL calculations, formulae and substitution must be shown.

3. Round off your answers to TWO decimal places.

QUESTION 5

Car racing is very popular in South Africa. Many young people want to test the speed of their cars and meet regularly at racetracks.

An oval ractrack has a lap distance of 2 000 m. The car has to complete 5 laps.



5.1 What distance will the car have covered at the end of 5 laps? (2)

5.2 What will the displacement of the car be from the starting point after completing 5 laps? (2)

In one of the races a car has a running start. The timekeeper starts the stopwatch as the car passes the starting point. The results are shown in the table below.

Number of laps	Time (s)
1	55
2	110
3	165
4	275
5	385

5.3 On the graph paper attached to your answer sheet, draw a graph of the number of laps (on the dependent y-axis) versus time (on the independent x-axis) for the car's run. Plot the points and connect them with straight lines. Also supply a suitable heading. (7)

5.4 Use your graph to determine how long the car took to complete 2,2 laps. Indicate on your graph how you obtained this value. (3)

5.5 Calculate the car's average speed (in $m \cdot s^{-1}$) for the 5 laps. (4)

5.6 How does the motion of the car during the first three laps compare with its motion during the last two laps? (2)

5.7 There is a public outcry about car racing on community roads. List FOUR concerns that the public has. (4)
[24]

QUESTION 6

A player kicks a ball vertically into the air. The mass of the ball is 0,44 kg. The ball reaches a maximum height of 20 m.

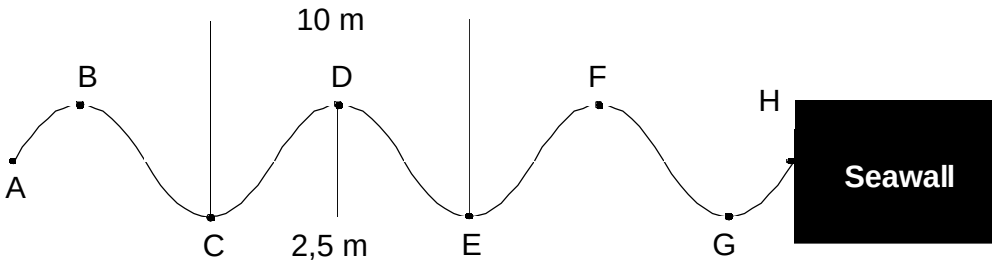
6.1 Calculate the force that the earths exerts on the ball. (4)

6.2 Calculate the gravitational potential energy gained by the ball at its highest point. (4)

6.3 Calculate the speed of the ball just before it hits the ground. (4)
[12]

QUESTION 7

Water waves crash against a seawall around the harbour. Six waves hit the seawall in 4 s. The distance between successive troughs is 10 m. The height of the waveform trough to crest is 2,5 m.



7.1 How many complete waves are indicated in the sketch? (2)

7.2 Write down the letters that indicate any TWO points that are:

7.2.1 In phase (2)
7.2.2 Out of phase (2)
7.2.3 Represent ONE wavelength (2)

7.3 Calculate the amplitude of the wave. (2)

7.4 Show that the period of the wave is 0,67 s. (2)

7.5 Calculate the frequency of the waves. (2)

7.6 Calculate the velocity of the waves. (2)
[18]

QUESTION 8

In a rope, a pulse of amplitude +15 mm is travelling to the right and a pulse of amplitude -10 mm is travelling to the left.

8.1 Make a labelled sketch to represent these two pulses. (2)

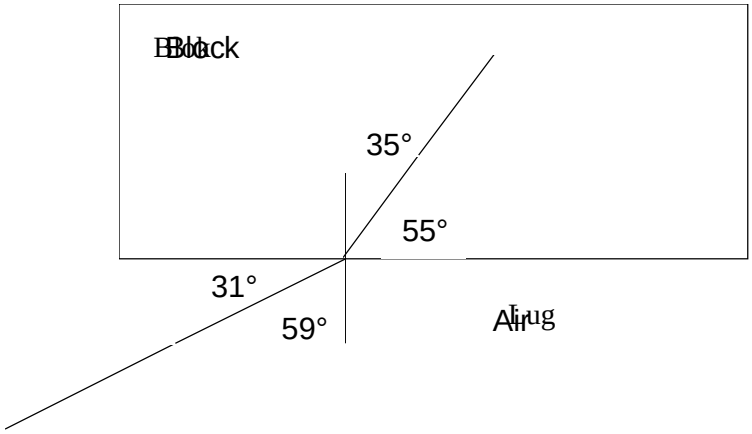
8.2 What type of interference will take place when these two pulses meet? (2)

8.3 Make a labelled sketch to represent the resulting pulse:

8.3.1 When they cross each other (2)
8.3.2 After they have crossed each other (2)
[8]

QUESTION 9

Light travels from air into a transparent rectangular block as shown below.



9.1 Write down the value of the angle of incidence. (1)

9.2 Write down the value of the angle of refraction. (1)

9.3 Calculate the refractive index of the block. (4)

9.4 Redraw and complete the above diagram (NOT to scale) to show the ray leaving the block at the second surface. Label the rays of light at the second surface. Include the angles and the normal at this surface. (4)

9.5 A ray light enters another block having a higher refractive index than the one above. State how the angle of refraction in this block will compare with the one above. Answer only LARGER, SMALLER or THE SAME. (2)

[12]

QUESTION 10

One of the suggested development targets in South Africa is that all communities in the country should gain access to electricity.

10.1 Suggest TWO ways in which provision of electricity would help the social and/or economic development of a community. (4)

10.2 In South Africa, most electricity is generated in coal-fired power stations. Give TWO reasons why coal is not the preferred source to generate electricity. (4)

10.3 State ONE sustainable source of electricity in South Africa. Briefly explain how it can be used. (4)

100 units of energy are used in an electric bulb per hour. Of this 98 units are lost in the form of heat while only 2 units are converted to light.

10.4 Calculate the efficiency of these bulbs. (3)

10.5 In an attempt to save electricity some municipalities decided to replace all household tungsten filament bulbs (incandescent bulbs) with compact fluorescent bulbs (energy-saving bulbs). These bulbs are 20% efficient. If the energy-saving bulbs are used instead of the old bulbs, determine the percentage of electricity saved. (2)

[17]

QUESTION 11

Nazli and Leila perform an experiment to determine the charge on a metallic sphere. They proceed as follows:

(i) They attach an inflated (blown up) balloon to one end of a wooden stick
(ii) They charge a balloon negatively by rubbing it with a woollen cloth
(iii) They obtain a metallic sphere mounted on an insulated stand. The sphere was earthed.

11.1 Why must the sphere in FIGURE A be earthed?

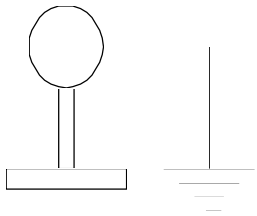


Fig (a)
FIGURE A

(2)

11.2 In FIGURE B the earth is removed. The negatively charged balloon is then brought close to the sphere. How will the charge be distributed on the sphere?

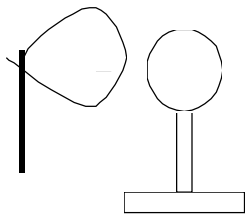


Fig (b)
FIGURE B

(2)

11.3 In FIGURE C the connection to the far end of the sphere is earthed. Do the negative charges move from the sphere to earth or from earth to the sphere?

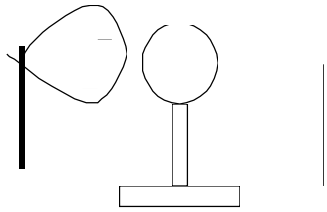


FIGURE C

(2)

11.4 In FIGURE D the connection on earth is once again removed.

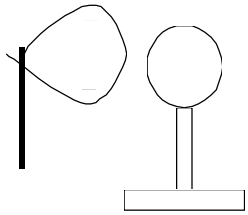


FIGURE D

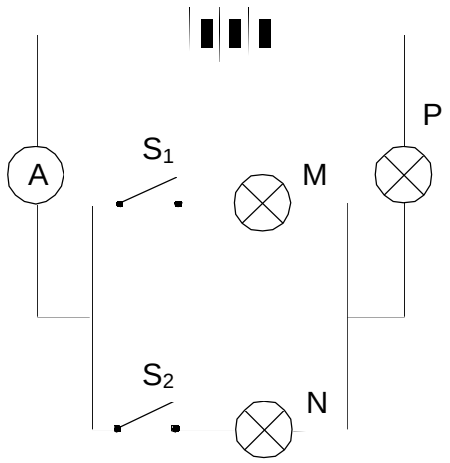
(2)

11.4.1 What will be the charge of the sphere now? (2)

11.4.2 State whether the balloon will be attracted or repelled by the sphere. (2)
[10]

QUESTION 12

In the circuit diagram below, three identical bulbs are connected as shown. The ammeter, connecting wires and battery have negligible resistance. Study the diagram and then answer the questions that follow.



12.1 *Switches S_1 and S_2 are open*. Which bulbs, if any, will light up? (2)

12.2 *Switch S_1 is closed and S_2 is open*. Compare the brightness of bulbs M, N and P. (3)

12.3 *Switches S_1 and S_2 are closed*. Compare the potential differences across bulbs M, N and P. (3)

For QUESTIONS 12.4 and 12.5 choose the answer from those in the brackets.

12.4 Adding bulbs in parallel causes the:

12.4.1 Resistance of the circuit to (increase/decrease/reamin the same) (2)

12.4.2 Potential difference across the battery to (increase/decrease/ remain the same) (2)

12.5 Parallel circuits can be regarded as (current/potential) dividers. (2)
[14]

TOTAL SECTION B: 115

GRAND TOTAL: 150

NATIONAL SENIOR CERTIFICATE EXAMINATION
NASIONALE SENIOR SERTIFIKAAT-EKSAMEN

DATA FOR PHYSICAL SCIENCES GRADE 10
PAPER 1 (PHYSICS)

GEGEWENS VIR FISIESE WETENSKAPPE GRAAD 10
VRAESTEL 1 (FISIKA)

TABLE 1: PHYSICAL CONSTANTS / *TABEL 1: FISIESE KONSTANTES*

NAME / *NAAM*	SYMBOL / *SIMBOOL*	VALUE / *WAARDE*
Accelaration due to gravity *Swaartekragversnelling*	*g*	9,8 $m \cdot s^{-2}$
Speed of light in a vacuum *Spoed van lig in a vacuum*	c	$3,0 \times 10^8$ $m \cdot s^{-1}$

TABLE 2: FORMULAE / *TABEL 2: FORMULES*

MOTION / *BEWEGING*

$v_f = v_i + a\Delta t$	$\Delta x = v_i \Delta t + \frac{1}{2} a \Delta t^2$
$v_f{}^2 = v_i{}^2 + 2a\Delta x$	$\Delta x = \left(\frac{v_f + v_i}{2} \right) \Delta t$

WEIGHT AND MECHANICAL ENERGY / *GEWIG EN MEGANIESE ENERGIE*

$F_g = mg$	$U = E_p = mgh$
$K = E_k = \frac{1}{2} mv^2$	

WAVES, LIGHT AND SOUND / *GOLWE, LIG EN KLANK*

$v = f\lambda$ or $v = \nu\lambda$	$T = \frac{1}{f}$ or $T = \frac{1}{\nu}$
$n_i \sin\theta_i = n_r \sin\theta_r$	$n = \frac{c}{v}$

ELECTRICITY AND MAGNETISM / *ELEKTRISITEIT EN MAGNETISME*

$I = \frac{Q}{\Delta t}$	$V = \frac{W}{Q}$

PHYSICAL SCIENCES GRADE 10 ANSWER SHEET
FISIESE WETENSKAPPE GRAAD 10 ANTWOORDBLAD

QUESTION 1 / ***VRAAG 1***

1.1 _____ (1)

1.2 _____ (1)

1.3 _____ (1)

1.4 _____ (1)

1.5 _____ (1)

[5]

QUESTION 2 / ***VRAAG 2***

2.1 _____ (1)

2.2 _____ (1)

2.3 _____ (1)

2.4 _____ (1)

2.5 _____ (1)

[5]

QUESTION 3 / ***VRAAG 3***

3.1 _____ (2)

3.2 _____ (2)

3.3 _____ (2)

3.4 _____ (2)

3.5 _____ (2)

[10]

QUESTION 4 / ***VRAAG 4***

4.1	A	B	C	D
4.2	A	B	C	D
4.3	A	B	C	D
4.4	A	B	C	D
4.5	A	B	C	D

(5 x 3) [15]

TOTAL SECTION A / ***TOTAL SECTION A: 35***

EXAMINATION NUMBER:

QUESTION 5.3