

Preamble for Physics

The Examinations Council of Zambia has made adjustments to the assessment of **Physics** at Grade 12 level so as to be in line with the revised **Physics** Senior Secondary School Syllabus of 2013 developed by Curriculum Development Centre (CDC) of the Ministry of General Education.

Purpose

The purpose of the Physics examination is to measure learners' competencies and achievements as outlined in the Grade 10–12 syllabus. The examination will also be used for certification of learners' achievements as well as entry into tertiary institutions and the engagement in Entrepreneurial activities.

Assessment Objectives

Candidates will be assessed against the following Objectives:

Knowledge with Understanding

1. state and explain physics phenomena, facts, concepts, terminologies theories and laws
2. understand and use scientific symbols, conversions, quantities and units
3. demonstrate knowledge of physics instruments and apparatus, and their safe operation
4. state and determine quantities in physics
5. demonstrate knowledge of technological applications of physics with their social, economic and environmental relevance

Handling Information and Solving Problems

1. locate, select, organise and present information from a variety of sources
2. translate information from one form to another
3. manipulate numerical and other data
4. identify patterns and draw inferences from information
5. explain phenomena, patterns and scientific relationships
6. make predictions and propose hypotheses
7. solve problems using physics principles

Experimental and Investigative Skills

1. follow a sequence of instructions
2. use techniques, apparatus, measuring devices and materials effectively and safely
3. make and record observations, measurements, calculations and estimates with due regard to precision, accuracy and units
4. interpret, evaluate and report upon observations and experimental data
5. identify problems, design/plan and carry out investigations, including the selection of techniques, apparatus, measuring devices and materials
6. evaluate methods and suggest possible improvements

Test Design

The examination will be made up of three papers, namely Physics Paper 1, Physics Paper 2 and Physics Paper 3, as structured in the table below.

Paper	Code	Paper type	Number of Questions	Total Marks	Duration	Weighting
Physics Paper 1	5054/1	Theory	40	40	1 hour	25%
Physics Paper 2	5054/2	Theory	12	80	2 hours	50%
Physics Paper 3	5054/3	Practical	4	40	2 hours 15 minutes	25%
Total					160	100%

EXAMINATIONS COUNCIL OF ZAMBIA

Examination for School Certificate Ordinary Level

Physics

5054/1

Paper 1 Multiple Choice

Additional information:

- Multiple Choice answer sheet
- Soft clean eraser
- Soft pencil (type B or HB is recommended)
- Electronic Calculator/Mathematical tables

Time 1 hour

Instructions to Candidates

Look at the left hand side of your answer sheet. Ensure that your name, the school/centre name and subject paper are printed. Also ensure that the subject code, paper number, centre code, your examination number and the year are printed and shaded. Do not change the already printed information.

Write your name, centre number and candidate number on the Answer Sheet in the spaces provided unless this has already been done for you.

There are **forty (40)** questions in this paper.

Answer all questions.

For each question there are four possible answers: **A, B, C** and **D**. Choose the **one** you consider correct and record your choice in **soft pencil** on the Answer Card provided.

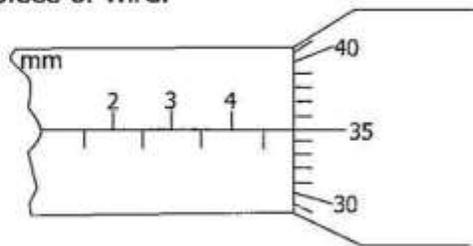
Information for Candidates

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this Question Paper.

Cell phones are not allowed in the examination room.

- 1 The diagram below shows an instrument being used to measure the diameter of a piece of wire.

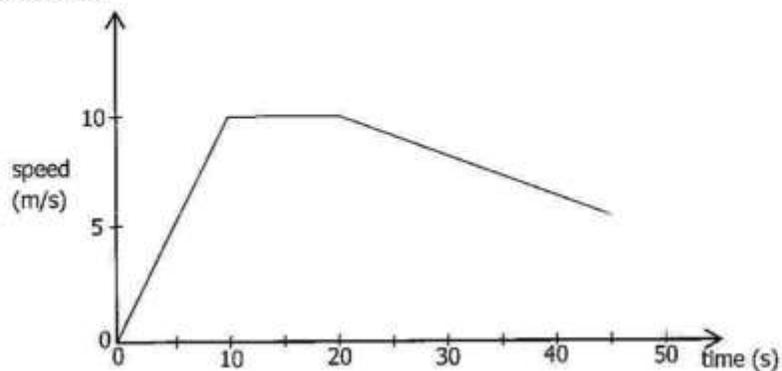


If the instrument has zero error of -0.01mm , what is the diameter of the wire?

- A** 4.34mm
B 4.51mm
C 4.84mm
D 8.01mm
- 2 Which quantity is measured in units of newton per kilogram?
- A** Weight
B Speed
C Momentum
D Acceleration
- 3 Mercury has a relative density of 13.6. Pure water has a relative density of 1. What volume in cubic metres (m^3) is occupied by 6 800kg of mercury?
- A** 0.5m^3
B 1.0m^3
C 6.8m^3
D 14.6m^3
- 4 A boy pushes a table of mass 80kg across a floor at a constant speed of 1.5m/s by exerting a horizontal force against friction of 200N. Determine the acceleration of the table, the friction force experienced and the work done by the boy in 6s.

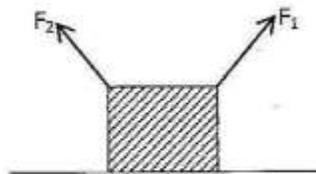
	Acceleration/ m/s^2	Friction force/N	Work done/J
A	0	200	1800
B	2.5	0	1800
C	0	200	480
D	2.5	0	480

- 5 The diagram below shows a graph representing the motion of a car over a period of 45 seconds.



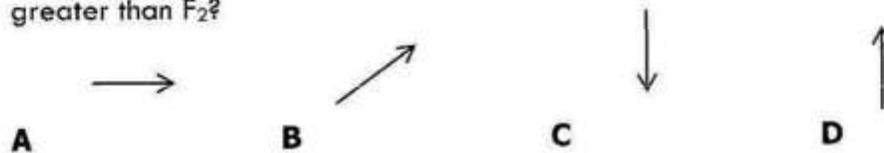
What is the total distance covered by the car in the given time?

- A 150.0m
 B 187.5m
 C 287.5m
 D 337.5m
- 6 The diagram below shows two forces acting on a body resting on a flat surface.



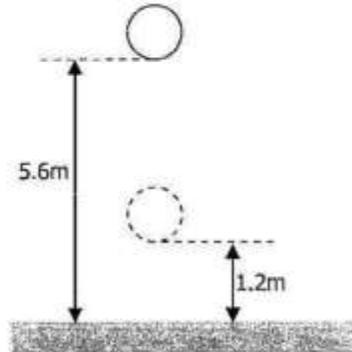
The forces are at equal angles to the vertical.

Which direction best represents the direction of the resultant force given that F_1 is greater than F_2 ?



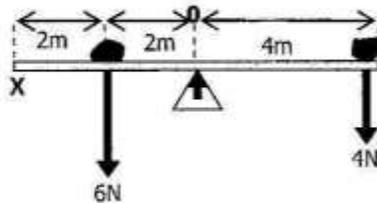
- 7 A force is applied to an object on a horizontal smooth surface. What property of the object must be known in order to calculate the objects acceleration?
- A Density
 B Mass
 C Volume
 D Weight

- 8 The diagram below shows a ball dropped from a height of 5.6m onto a flat surface. After impact, the ball rises to a height of 1.2m on rebound.



What is the speed of the ball at the instant of impact? (Take $g = 10\text{m/s}^2$)

- A 4.6m/s
 - B 9.4m/s
 - C 10.6m/s
 - D 11.7m/s
- 9 A learner balanced a uniform plank using stones as shown in the diagram below.



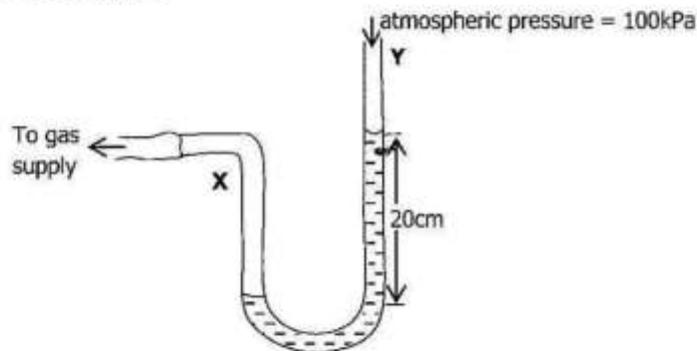
What is the moment of the 4N force about O?

- A 24Nm
 - B 16Nm
 - C 12Nm
 - D 4Nm
- 10 A force of 20N is exerted on a body of mass 10kg. The body moves through a distance of 4m.
What is the gain in kinetic energy of the body?
- A 400J
 - B 200J
 - C 160J
 - D 80J
- 11 Which of the following is **not** an example of a simple machine?
- A Combustion engine
 - B Crane
 - C Folk lifter
 - D Hydraulic system

- 12 Snow shoes of area 0.5m^2 worn by an Eskimo of mass 40kg exert pressure on the surface. What is the value of the pressure? (Taking 'g' to be 10N/kg .)

- A 80N/m^2
- B 100N/m^2
- C 200N/m^2
- D 800N/m^2

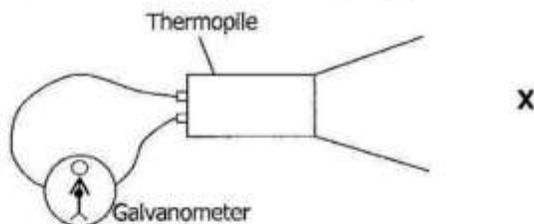
- 13 The diagram below shows a gas manometer that contains a liquid of density $10\,000\text{kg/m}^3$.



End **X** is connected to a gas supply of unknown pressure while end **Y** is open to the atmosphere at a pressure of 100kPa .

What is the pressure of the gas supply?

- A 120kPa
 - B 100kPa
 - C 80kPa
 - D 20kPa
- 14 The diagram below shows a thermopile which is connected to a galvanometer. Both the thermopile and the galvanometer are in good working condition.

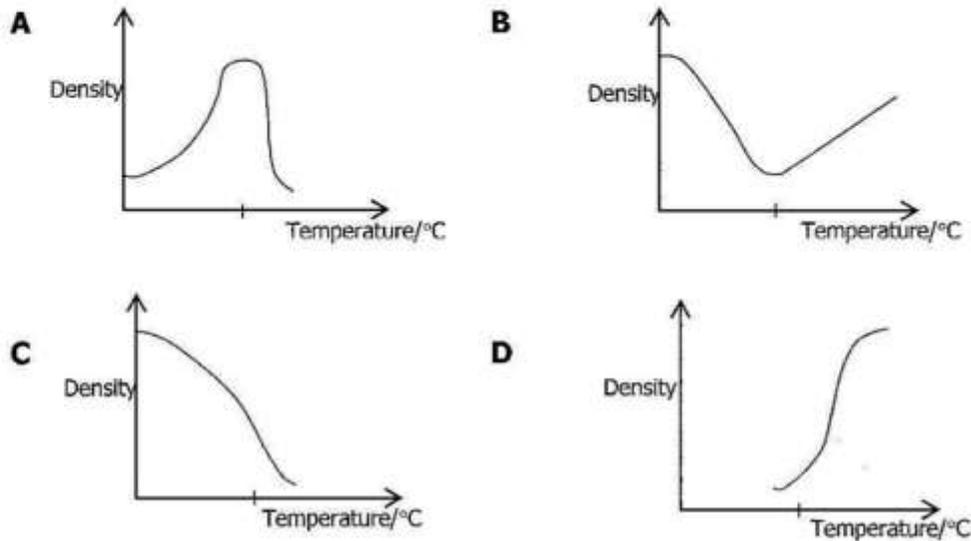


The thermopile faces the letter **X** and the galvanometer needle shows no deflection.

The reason for this may be that ...

- A **X** is a bad conductor of heat.
- B the temperature of **X** is constant.
- C there is no heat from **X** into the thermopile.
- D there is a short circuit.

15 The diagrams below show four density-temperature graphs.



Which of the graphs **A**, **B**, **C**, or **D** above would be for a liquid that supports aquatic life at 4°C?

16 The Luangwa bridge in Zambia is an example of a bridge that has one end fixed and the other end is free but on rollers.

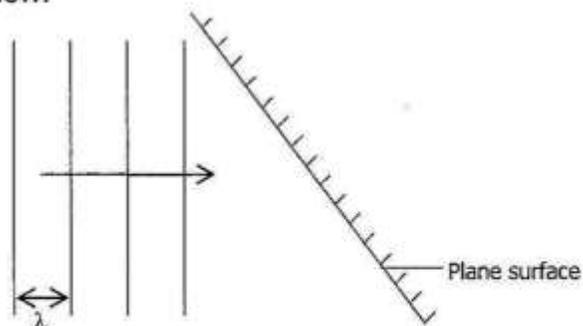
The use of the rollers is to allow for expansion ...

- A** as heavy vehicles cross the bridge.
- B** during hot weather.
- C** when the water levels drop in the river.
- D** when the water level rises in the river.

17 Green house effect is the heat-trapping action by the atmosphere through ...

- A** carbon dioxide, nitrogen, oxygen.
- B** carbon dioxide, methane, nitrogen.
- C** water vapour, oxygen, carbon dioxide.
- D** water vapour, methane, carbon dioxide.

18 In an experiment using a ripple tank, plane wave fronts arrive at a surface as shown in the diagram below.



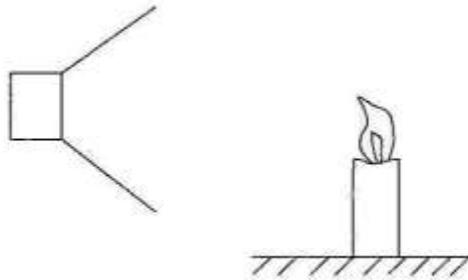
Which of the following correctly describes the waves after they are reflected from the surface?

	Speed of waves	Wavelength
A	Faster	Shorter
B	Same	Longer
C	Slower	Same
D	Same	Same

19 Light of one wavelength and colour is called ... light.

- A** coherent
- B** laser
- C** monochromatic
- D** polarised

20 The diagram below shows a lighted candle put in front of a loudspeaker which is making a loud steady note. The flame vibrates because of the waves coming from the loud speaker.



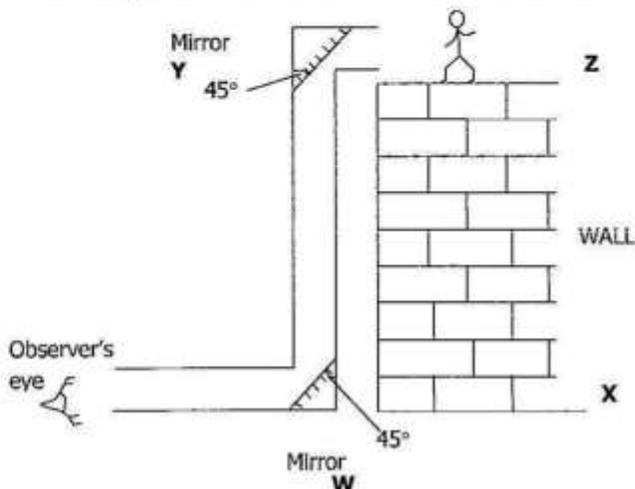
Which type of waves are being produced by the loudspeaker and in which direction is the flame vibrating?

	Type of wave	Direction of vibration
A	Longitudinal	↕
B	Transverse	↕
C	Longitudinal	↔
D	Transfer	↔

21 What reason explains why we can not hear the sound of the explosion as it occurs in the outer space? This is because sound ...

- A** waves are too slow to reach the earth.
- B** waves are reflected by the clouds.
- C** needs a material medium for propagation.
- D** is absorbed by the gases in outer space.

- 22 The diagram below shows an experimenter observing a person using a periscope.



Which letter will represent the location of the image seen by the observer?

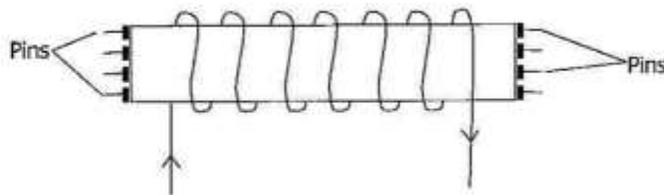
- A W
 - B X
 - C Y
 - D Z
- 23 A camera uses a lens to produce an image of a film.
Which order is correct about the type of lens, nature of the image and its size?

	Type of lens	Nature of image	Size of image
A	Convex	Real, Inverted	Diminished
B	Convex	Real, Upright	Diminished
C	Concave	Virtual, Upright	Diminished
D	Concave	Virtual, Inverted	Diminished

- 24 The refractive index for water is $\frac{4}{3}$. The apparent depth of a swimming pool is 15m. How deep is the swimming pool?

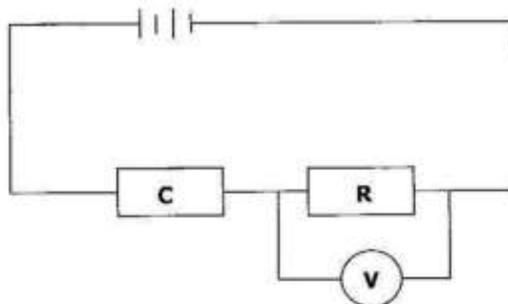
- A 10.25m
 - B 15m
 - C 20m
 - D 33m
- 25 Which other term below can be used for magnetic screening?
- A Flux
 - B Permeability
 - C Permittivity
 - D Shielding

- 26 A strong electromagnet is used to attract pins as shown in the diagram.



What happens when the number of turns in the coil is doubled?

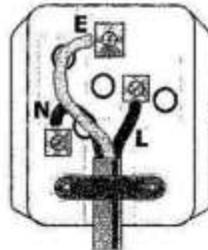
- A** All the pins are attracted.
B Fewer pins are attracted.
C The same number of pins is attracted.
D Many more pins are attracted.
- 27 Apart from induction, what other method can be used to charge an uncharged body?
- A** Lighting
B Contact
C Shielding
D Heating
- 28 Which unit measures the rate at which charge flows through an element of an electric kettle?
- A** Ampere
B Kilowatt hour
C Volt
D Watt
- 29 A circuit component **C** was connected in series with a resistor **R** as shown in the diagram below. A voltmeter **V** was connected across the resistor.



Which of the following can be used as component **C** to vary the reading on the voltmeter?

- A** Electromagnet
B Switch
C Generator

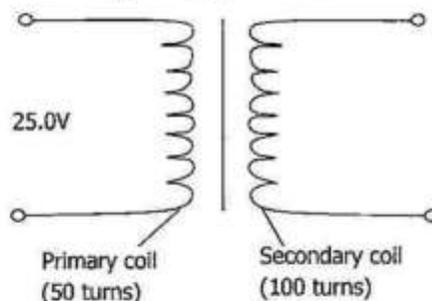
- D** Rheostat
- 30** A hair dryer of 2000W rating is used in a salon every day. If the cost of electricity is 55 ngwee, how much would it cost to operate it for 5 hours each day for 5 days?
- A** K2 750.00
B K275.00
C K27.50
D K2.75
- 31** The diagram below shows a standard mains plug.



What are the correct colours for the wires?

	N	E	L
A	Blue	Green and Yellow	Brown
B	Blue	Brown	Green and Yellow
C	Brown	Green and Yellow	Blue
D	Green and Yellow	Brown	Blue

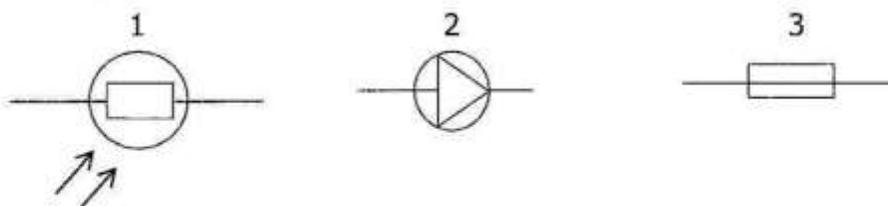
- 32** A transformer has 50 turns on its primary coil and 100 turns in its secondary coil. An alternating voltage of 25.0V is connected across the primary coil.



What is the voltage across the secondary coil?

- A** 12.5V
B 50.0V
C 100V
D 200V

33 The diagram below shows some circuit symbols.



Which is the correct order of the symbols shown?

	Diode	Light dependent resistor	Electric fuse
A	1	2	3
B	3	2	1
C	2	1	3
D	3	1	2

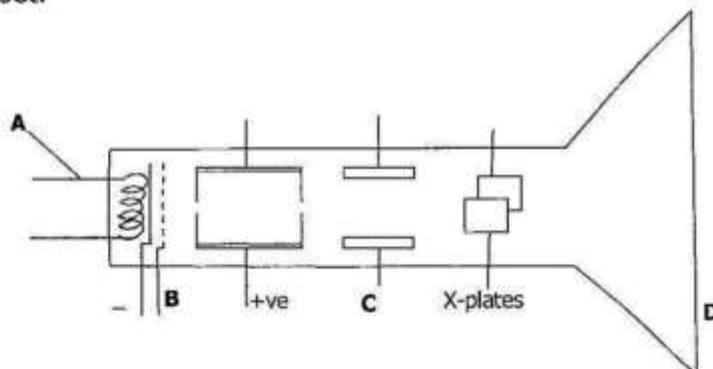
34 The diagram below shows two diodes.



Which of the following explains why diodes are referred to as rectifiers? They ...

- A** change alternating current into direct current.
- B** alter the operation of a motor and generator.
- C** contain possible solutions to circuitry.
- D** solve circuit problems.

35 The diagram below shows a Cathode Ray Oscilloscope used in an old television set.



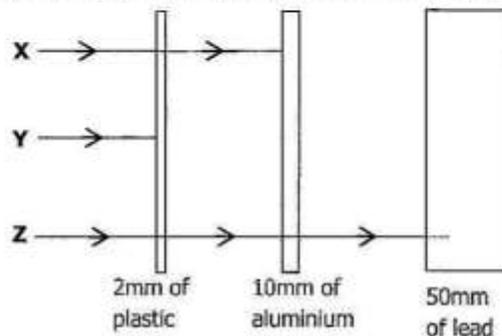
Which of the parts labeled **A**, **B**, **C** or **D** can be used to increase the brightness of the trace on the screen?

- 36 The diagram below shows a truth table.

Input 1	Input 2	Output
0	0	0
0	1	1
1	0	1
1	1	1

For which gate is the truth table above?

- A OR
 B NOR
 C NAND
 D NOT
- 37 According to Geiger-Marsden's experiment on the structure of an atom, ...
- A most of the space in the nucleus of an atom is empty.
 B atoms of a molecule are concentrated at the centre.
 C the positive charge of an atom is found at the centre of the atom.
 D the negative charge of an atom is concentrated at the centre of the atom.
- 38 The diagram below shows three different types of radiation **X**, **Y** and **Z**.



Which order correctly identifies **X**, **Y** and **Z**?

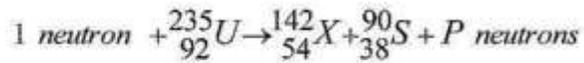
	X	Y	Z
A	γ-rays	α-particles	β-particles
B	α-particles	β-particles	γ-rays
C	β-particles	γ-rays	α-particles
D	β-particles	α-particles	γ-rays

- 39** A sample of wood contains 9.0×10^{16} nuclei of carbon 14. The nuclei undergoes radioactive decay. It has a half-life of 5700 years.

How many carbon 14 nuclei remain in this sample after 17 100 years?

- A** 1.1×10^2
- B** 1.1×10^{16}
- C** 3.0×10^{16}
- D** 4.5×10^{16}

- 40** Consider the nuclear equation below.



What is the number of neutrons **P**?

- A** 3
- B** 4
- C** 5
- D** 6

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