

SC 5121
WASSCE (SC) 2019
PHYSICS 1
Objective Test
1¼ hours

1

Name:.....

Index Number:.....

THE WEST AFRICAN EXAMINATIONS COUNCIL
West African Senior School Certificate Examination (WASSCE) for School Candidates, 2019

SC 2019

PHYSICS 1
PAPER 1
OBJECTIVE TEST
[50 marks]

1¼ hours

Do not open this booklet until you are told to do so. While you are waiting, write your name and index number in the spaces provided at the top right-hand corner of this paper and thereafter, read the following instructions carefully.

- Use HB pencil throughout.
- If you have got a blank answer sheet, complete its top section as follows.
 - In the space marked *Name*, write in capital letters your surname followed by your other names.
 - In the spaces marked *Examination, Year, Subject and Paper*, write 'WASSCE (SC)', '2019', 'PHYSICS' and '1' respectively.
 - In the box marked *Index Number*, write your index number vertically in the spaces on the left-hand side. There are numbered spaces in line with each digit. Shade carefully the space with the same number as each digit.
 - In the box marked *Paper Code*, write the digits 512113 in the spaces on the left-hand side. Shade the corresponding numbered spaces in the same way as for your index number.
 - In the box marked *Sex*, shade the space marked M if you are male, or F if you are female.
- If you have got a pre-printed answer sheet, check that the details are correctly printed, as described in 2 above. In the boxes marked *Index Number, Paper Code and Sex*, reshade each of the shaded spaces.
- An example is given below. This is for a male candidate, whose name is Chinedu Oladapo DIKKO, whose index number is 4251102068 and who is offering Physics 1.

THE WEST AFRICAN EXAMINATIONS COUNCIL

PRINT IN BLOCK LETTERS

Name: DIKKO CHINEDU OLADAPO Examination: WASSCE (SC) Year: 2019
Surname Other Names

Subject: PHYSICS Paper: 1

INDEX NUMBER	
4	0 1 2 3 4 5 6 7 8 9
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5	0 1 2 3 4 5 6 7 8 9
1	0 1 2 3 4 5 6 7 8 9
1	0 1 2 3 4 5 6 7 8 9
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2	0 1 2 3 4 5 6 7 8 9
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6	0 1 2 3 4 5 6 7 8 9
8	0 1 2 3 4 5 6 7 8 9

PAPER CODE	
5	0 1 2 3 4 5 6 7 8 9
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1	0 1 2 3 4 5 6 7 8 9
1	0 1 2 3 4 5 6 7 8 9
3	0 1 2 3 4 5 6 7 8 9

SEX	
M	F

Indicate your sex by shading the space marked M (for Male) or F (for Female) in this box:

For Supervisors only.
If candidate is absent shade this space:

INSTRUCTIONS TO CANDIDATES

- Use grade HB pencil throughout.
- Answer each question by choosing one letter and shading it like this: [A] [B] [C]
- Erase completely any answers you wish to change.
- Leave extra spaces blank if the answer spaces provided are more than you need.
- Do not make any markings across the heavy black marks at the right-hand edge of your answer sheet.

Answer **all** the questions.

Each question is followed by **four** options lettered **A** to **D**. Find out the **correct** options for **each** question and shade in **pencil** on your answer sheet, the answer space which bears the same letter as the option you Chosen. Give only **one** answer to **each** question.

An example is given below.

A series LC circuit has capacitance $50 \mu\text{F}$ and Inductance of $500 \mu\text{H}$. Calculate the frequency at which the circuit will resonate. [$\pi = 3.142$]

- A. 6365 Hz
- B. 3183 Hz
- C. 1006 Hz
- D. 503 Hz

The correct answer is 3183 Hz, which is lettered B and therefore answer space B would be shaded.

[A]

[B]

[C]

[D]

Think carefully before you shade the answer spaces; erase completely any answer(s) you wish to change Now answer the following questions

Do **all** rough work on this questions paper

Now answer the following questions.

1. The time rate of increase in velocity is called
- A. force.
 - B. momentum.
 - C. acceleration.
 - D. speed.

2. Which of the following quantities is a vector?
- A. Volume
 - B. Momentum
 - C. Energy
 - D. Speed

3. In an elastic collision, momentum is conserved as well as
- A. velocity.
 - B. kinetic energy.
 - C. potential energy.
 - D. speed.

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4. The induced current in a coil always flows in a direction so as to oppose the change that causes it. This statement is known as
- A. Coulomb's law.
 - B. Lenz's law.
 - C. Faraday's law.
 - D. Ampere's law.

5. Which of the following instruments can be used to compare the magnitudes of charges on two given bodies.
 - A. Electrophorus
 - B. Ebonite rod
 - C. Gold-leaf electroscope
 - D. Proof planes

6. A body of mass 2 kg is released from a point 100 m above the ground. Calculate its kinetic energy 80 m from the point of release.
 - A. 1600 J
 - B. 900 J
 - C. 600 J
 - D. 200 J

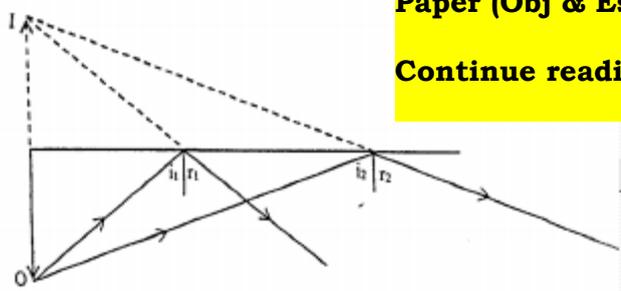
7. Which of the following waves is **not** mechanical?
 - A. Waves in pipes
 - B. Water waves
 - C. Radio waves
 - D. Sound waves

8. A loaded spring is set in simple harmonic motion. The force that tends to restore the load to its equilibrium position is
 - A. adhesive.
 - B. elastic.
 - C. frictional.
 - D. gravitational.

9. Which of the following cases cannot produce total internal reflection? A light ray travelling from
 - A. glass to water.
 - B. kerosene to air.
 - C. air to water.
 - D. water to ice.

10. The vacuum in a thermoflask reduces heat loss resulting from
 - A. radiation only.
 - B. conduction and convection only.
 - C. radiation and convection only.
 - D. conduction only.

11.



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The diagram above represents an experimental set-up for verifying

- A. lens formula.
- B. refraction laws.
- C. reflection laws.
- D. mirror formula.

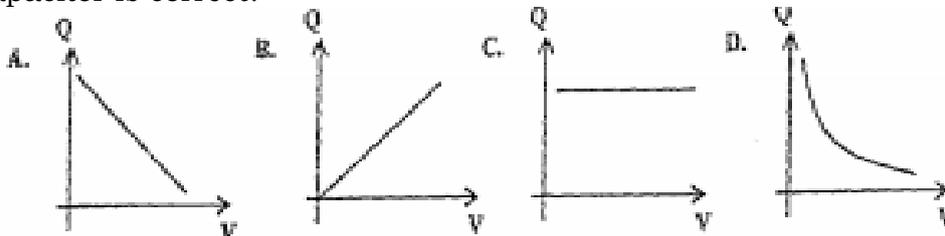
12. Which of the following statements about a moving object is **correct**?
- When accelerating, the resultant force acting on it must be equal to zero.
 - There must always be a non-zero resultant force acting on it.
 - At a steady velocity, the resultant force acting on it must be equal to zero.
 - At a steady velocity, the air resistance must be equal to zero.

13. If the efficiency of a transformer is 100%, which of the following equations would be correct?

- $N_p E_p = N_s E_s$
- $N_s I_p = N_p I_s$
- $N_s I_s = N_p I_p$
- $I_p E_s = I_s E_p$

14. A freshly demagnetized bar magnet is placed in the East-West direction to ensure that
- the molecular magnets remain randomly arranged.
 - the molecular magnets are properly aligned.
 - it is affected by the earth's magnetic field.
 - the magnetic domains are within the earth's field.

15. Which of the following graphs of a charge Q against potential difference V across capacitor is correct?



16. A small amount of air is introduced into the vacuum above the mercury in a mercury barometer tube. The mercury level goes down because the air molecules
- heat the mercury and make it to expand.
 - increase the pressure above the mercury.
 - cool the mercury and make it to contract.
 - decrease the pressure above the mercury.

17. Calculate the quantity of heat needed to change the temperature of 60 g of ice at 0°C to 80°C . [Specific latent heat of fusion of ice = $3.36 \times 10^5 \text{ J kg}^{-1}$

Specific heat capacity of water = $4.2 \times 10^3 \text{ J kg}^{-1} \text{ K}^{-1}$

- 4.80 kJ
- 20.16 kJ
- 40.32 kJ
- 22.17 kJ

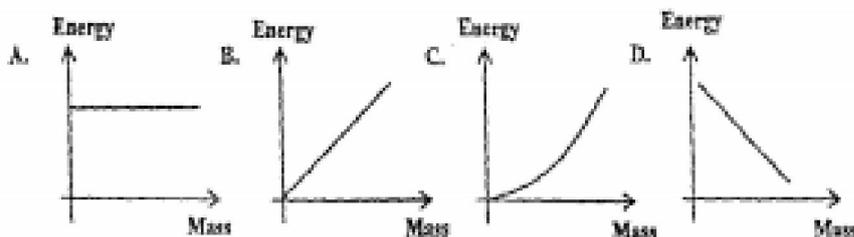
18. The wire of a platinum resistance thermometer has a resistance of 3.5Ω at 0°C and 10.5Ω at 100°C . Calculate the temperature of the wire when its resistance is 7.5Ω .

- 78°C
- 25°C
- 36°C
- 57°C

19. A transverse pulse of frequency 9 Hz travels 4.5 m in 0.6 s. Calculate the wavelength of the pulse.

- 3.33 m
- 0.30 m
- 0.83 m
- 1.20 m

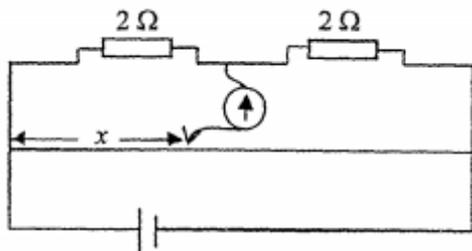
20. In which of the following media is speed of Sound the least?
- Air
 - Brass
 - Water
 - Wood
21. Which of the following characteristics of waves can a ripple tank be used to demonstrate?
- Reflection
 - Refraction
 - Diffraction
- I, II and III
 - II and III only
 - I and III only
 - I and II only
22. Which of the following graphs gives the **correct** relationship between energy and mass when mass is converted to energy.



23. An 800 kg car moving at 80 km hr^{-1} collides with a 1200 kg car moving at 40 km hr^{-1} in the same direction. If the cars stick together, calculate their common velocity.
- 60 km hr^{-1}
 - 8 km hr^{-1}
 - 40 km hr^{-1}
 - 56 km hr^{-1}
24. The mass of a load is doubled while the force acting on it is halved. The resulting acceleration of the load is
- quadrupled.
 - quartered.
 - halved.
 - doubled.
25. The maximum and minimum thermometer reads the
- maximum temperature during the day and the minimum temperature at night at all times.
 - maximum temperature at night and minimum temperature during the day from the last reset.
 - maximum temperature at night and minimum temperature during the day at all times.
 - maximum temperature during the day and minimum temperature at night from the last reset.
26. An *a.c.* generator can be converted to a *d.c.* generator by replacing the
- commutator with an armature.
 - armature with a commutator.
 - commutator with slip rings.
 - slip rings with a commutator.

27. Which of the following statements is the correct reason for using soft iron in making the armature of an electric bell?
- It is a diamagnetic material.
 - It loses its magnetism readily.
 - It is not easily magnetized.
 - It retains its magnetism for a long time.

28.



The diagram above illustrates a meter bridge circuit under balanced condition. Determine the value of x .

- 71.4 cm
 - 10.0 cm
 - 28.6 cm
 - 57.2 cm
29. Which of the following devices is used for storing electric charges?
- Transformer
 - Ammeter
 - Potentiometer
 - Capacitor

An electron of mass $9.1 \times 10^{-31} \text{ kg}$ moves with a speed of $2.0 \times 10^6 \text{ ms}^{-1}$ round the nucleus of an atom in a circular path of radius $6.1 \times 10^{-11} \text{ m}$.

Use the information to answer questions **30** and **31**.

30. Determine the angular speed of the electron.
- $3.28 \times 10^{16} \text{ rad s}^{-1}$
 - $8.55 \times 10^3 \text{ rad s}^{-1}$
 - $9.11 \times 10^{13} \text{ rad s}^{-1}$
 - $5.22 \times 10^{15} \text{ rad s}^{-1}$

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SECTION B

ESSAY

1½ hours

[60 marks]

Answer **eight** questions in all.

Five questions from Part I and **three** questions from Part II.

PART I

[15 marks]

Answer any **five** questions from this part.

All questions carry equal marks.

1. (a) Define *strain*.
(b) A rubber band is stretched to twice its original length. Calculate the strain on the rubber band.
2. State **three** materials used for making optical fibres.
3. Name **three** classes of magnetic materials.
4. (a) What is an *intrinsic semiconductor*?
(b) Distinguish between the *p-type* and *n-type* semiconductors.
- 5.
6. A black body radiates maximum energy when its surface temperature T and the corresponding wavelength λ_{\max} are related by the equation, $\lambda_{\max} T = \text{constant}$. Given the values of the constant and surface temperature as $2.9 \times 10^{-3} \text{ mK}$ and 57°C respectively, Calculate the frequency of the energy radiated.
7. (a) What does the acronym *LASER* stand for?
(b) What is a *laser*?

(PART II)

[45 marks]

Answer any **three** questions from this part.

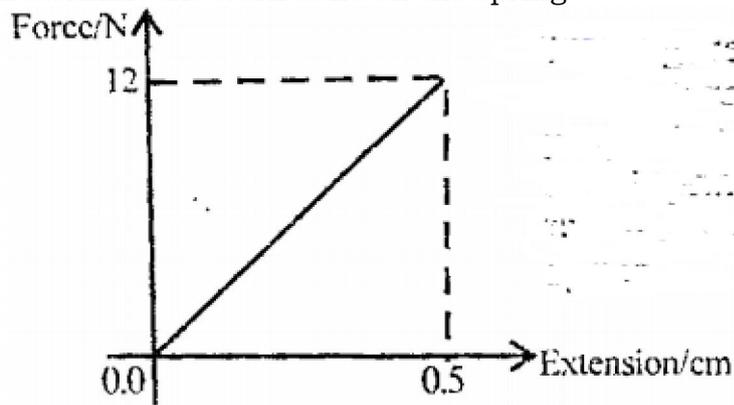
All questions carry equal marks.

8. (a) Define *uniform acceleration*,
(b) Forces act on a car in motion, list the:
(i) horizontal forces and their directions;
(ii) vertical forces and their directions,
(c) A car starts from rest and accelerates uniformly for 20s to attain a speed of 25 ms^{-1} . It maintains this speed for 30s before decelerating uniformly to rest. The total time for the journey is 60 s.
(i) Sketch a velocity-time graph for the motion,
(ii) Use the graph to determine the:
(α) total distance travelled by the car;
(β) deceleration of the car.

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- d. The figure here illustrates force-extension graph for a stretched spiral spring. Determine the work done on the spring



9. (a) List **two** factors **each** that affect heat loss by:
(i) Radiation; (ii) convection,
(b) State two factors that determine the quantity of heat in a body.
(c) Explain the statement: The specific latent heat of vaporization of mercury is $2.72 \times 10^5 \text{ J kg}^{-1}$.
(d) A jug of heat capacity 250 J kg^{-1} contains water at 28°C .
An electric heater of resistance 35π connected to a 220 V source is used to raise the temperature of the water until it boils at 100°C in 4 minutes.
After another 5 minutes, 300 g of water has evaporated. Assuming no heat is lost to the surroundings, calculate the:
(i) Mass of water in the jug before heating;
(ii) Specific latent heat of vaporization of steam.
[Specific Heat Capacity of Water = $4200 \text{ J kg}^{-1} \text{ K}^{-1}$]

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