403 S. H. S. C. E.
MAY 2011
PHYSICS **1&2**
Objective and Essay Tests
2½ hours

Name:.....

Identification Number: .....

THE WEST AFRICAN EXAMINATIONS COUNCIL

Senior High School Certificate Examination

May 2011 **PHYSICS** 2½ hours

*Do **not** open this booklet until you are told to do so. While you are waiting, read and observe the following instructions carefully. Write your **name** and **identification number** in the space provided above.*
*This paper consists of **two** parts: Papers 1 and 2. Answer Paper 1 on your Objective Test Answer Sheet and Paper 2 in your Answer Booklet. **Paper 1** will last for **1 hour** after which the answer sheet will be collected. Do **not** start **Paper 2** until you are told to do so. **Paper 2** will last for 1½ **hours.***

PAPER 1

OBJECTIVE TEST

[40 marks] 1 hour

1. Use **2B** pencil throughout.
2. On the objective answer sheet supplied, provide the following details **correctly:**
   (a) Supply the information required in the spaces marked *CENTER NAME, CENTER No, SCHOOL NAME and SCHOOL No.*.
   (b) In the space marked *STUDENT'S NAME,* write your **surname** followed by your **other names.** Write your **identification number** in the space marked *STUDENT No.*
   (c) In the spaces marked *SUBJECT and GRADE,* write PHYSICS and 12TH in that order.
   (d) In the box marked *IDENTIFICATION NUMBER,* provide your **identification number** vertically in the spaces on the left-hand side, and shade each numbered space in line with each digit. This identification number must be the same as the one indicated on your Admission Slip. Repeat the process with the correct information for the box marked *YEAR OF FIRST ENTRY.*
   (e) In the box marked *Subject Code,* write the digits 403 vertically in the spaces on the left-hand side. **Shade** the corresponding numbered spaces as you did for your identification number.
3. An example is given below. This is for a female candidate whose *name* is Wynna A. FANIA .
Her *identification number* is 001011210, her first entry is in 2011 and she is offering *PHYSICS.*

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DWEH SAGBEH ACADEMY CENTER NAME	981001 CENTER No.
BOLIDOE TELEE HIGH SCHOOL SCHOOL NAME	001011 SCHOOL No.
FANIA, WYNNA A. STUDENT NAME	210 STUDENT No.
PHYSICS SUBJECT	12TH GRADE

IDENTIFICATION NUMBER

0	●	⇨	⇨	⇨	⇨	⇨	⇨	⇨	⇨	⇨
0	●	⇨	⇨	⇨	⇨	⇨	⇨	⇨	⇨	⇨
1	⇨	■	⇨	⇨	⇨	⇨	⇨	⇨	⇨	⇨
0	●	⇨	⇨	⇨	⇨	⇨	⇨	⇨	⇨	⇨
1	⇨	■	⇨	⇨	⇨	⇨	⇨	⇨	⇨	⇨
1	⇨	■	⇨	⇨	⇨	⇨	⇨	⇨	⇨	⇨
2	⇨	⇨	●	⇨	⇨	⇨	⇨	⇨	⇨	⇨
1	⇨	■	⇨	⇨	⇨	⇨	⇨	⇨	⇨	⇨
0	●	⇨	⇨	⇨	⇨	⇨	⇨	⇨	⇨	⇨

For Supervisors only.
If a candidate is absent ▭
shade this space.

YEAR OF FIRST ENTRY

2	⇨	⇨	●	⇨	⇨	⇨	⇨	⇨	⇨	⇨
0	●	⇨	⇨	⇨	⇨	⇨	⇨	⇨	⇨	⇨
1	⇨	■	⇨	⇨	⇨	⇨	⇨	⇨	⇨	⇨
1	⇨	■	⇨	⇨	⇨	⇨	⇨	⇨	⇨	⇨

SUBJECT CODE

4	⇨	⇨	⇨	⇨	■	⇨	⇨	⇨	⇨	⇨
0	●	⇨	⇨	⇨	⇨	⇨	⇨	⇨	⇨	⇨
3	⇨	⇨	⇨	■	⇨	⇨	⇨	⇨	⇨	⇨

Shade the space marked
M (for Male) or F(for Female) M ▭ F ■
In this box

PAPER 1

OBJECTIVE

[40 marks] **1 hour**

*Answer **all** questions*

*There are **fifty** questions in this test. Each question is followed by **four** options labeled **A** to **D**. Determine the correct option for each question and shade in **pencil** on your answer sheet the space which bears the same letter as the option you have chosen. Give only **one** answer to each question.*
*Where necessary, use **g = 10m/s²**.*

An example is given below.

A state of matter that has both definite shape and volume is called
A. gas
B. liquid
C. plasma
D. solid

The correct answer is solid which is labeled D and therefore the answer space D would be shaded.

A B C ➧

Think carefully before you shade the spaces, erase completely any answer you wish to change.
Do all rough work in this question paper.

Now answer the following questions.

1. Which of the following instruments is used to measure relative humidity?

A. Hydrometer
B. Barometer
C. Hygrometer
D. Thermometer

2. Images formed by convex mirror are always

A. inverted, real and diminished.
B. erect, virtual and diminished.
C. erect, virtual and magnified
D. erect, real and magnified.

3. Which of the following units is **not** correctly paired with its quantity?

A. Meter .....length
B. Coulomb..... length
C. Kilogram.....mass
D. Farad.....capacitance

4. Which of the following is **not** a primary pigment?

A. Magenta
B. Yellow
C. Blue.
D. Cyan

5. A car with a mass of 50kg is moving at 10m/s. What is the car's kinetic energy?
   A. 25j
   B. 50j
   C. 2500j
   D. 5000j

6. All of the following are properties of a longitudinal wave **except**
   A. compression
   B. polarization
   C. reflection.
   D. refraction

7. Which of the following statements about solid, liquid and gas is **most** correct?
   A. Their molecules are always in motion.
   B. They have the same inter-molecular force.
   C. Their molecules have the same size.
   D. They all have fixed volume.

8. A particle moving with a velocity of 10m/s decelerates at $4m/s^2$ for 4 seconds. How far does the particle move during the **third** second?
   A. 20 m
   B. 34m
   C. 58m
   D. 72m

9. The difference between a crystalline solid and an amorphous sold is that a crystalline solid
   A. has cubic structure which amorphous solid has hexagonal structure.
   B. is white while amorphous solid is yellow.
   C. is always hard while amorphous solid is always soft.
   D. has regular repeating pattern while amorphous solid has not.

10. An atom has 6 protons, 7 neutrons and 6 electrons. What is the mass number of the atom?
   A. 6
   B. 7
   C. 12
   D. 13

11. Th height of the mercury column in a simple barometer is **most** likely to be affected by
   A. the surface tension of the mercury.
   B. a slight tilt on the barometer tube.
   C. change in room temperature.
   D. the introduction of air bubbles into the vacuum space.

12. A 4.5kg of rice rests on a level table. What is the reaction force of the table on the bowl?

A. 4.0N
B. 4.5N
C. 40N
D. 45N

13. A bar of gold is 10.0cm x 5.0cm x 5.0cm at a room temperature of 25°C. What is its volume at 50°C? [take α for gold = 1.4 x 10^{5}/°C].

A. 0.263 cm^3
B. 2.5cm3
C. 8.75cm^3
D. 87.5cm3

14. The potential difference across a resistence wire is 12mV and the current flowing through the wiree is 4μA. What is the resistance of the wire?

A. 3μΩ
B. 3mΩ
C. 3kΩ
D. 3MΩ

15. Which of the following represents two equal forces that act on a point in opposite directions?

A. Torgue
B. Couple
C. Parallel forces
D. Concurrent forces

16. Calculate the equivalent resistance of three resistors of resistances, 8Ω, 6 Ω, and 8Ω, connected in parallel in a circuit.

A. 22Ω
B. 12Ω
C. 2.4Ω
D. 1.2ΩΩ

17. The ratio of the density of a susbstance to that of the density of a standard is referred to as

A. specific gravity
B. heat capacity
C. upthrust
D buoyancy.

18. The amount of material in an object is called the object's

A. weight.
B. volume
C. mass.
D. density.

19. A cell of e.m.f of 1.5V and internal resistance of 2.5Ω connected in series with an ammeter of resistance 0.5Ω and a resistor of resistance 7.0Ω.
Calculate the current in the circuit.

A. 0.60A
B. 0.20A
C. 0.15A
D. 0.12A

). The image of a pin formed by a diverging lens of focal length 20cm is 5cm from the lens. Calculate the distance of the pin from the lens.

A. -6.7cm
B. -4.0cm
C. 4.0cm
D. 6.7cm

21. A concave mirror of radius of curvature 20cm has an object placed 15cm from its pole. What is the magnification of the image formed?

A. 1
B. 2
C. 3
D. 4

22. At what point does pure water freeze on the Celsius scale?

A. 0°C
B. 32°C
C. 100°C
D. 212°C

23. Which of the following are magnetic substances?

I. Iron
II. Copper
III. Cobalt
IV. Steel

A. I and II only
B. I, II and III
C. I, II and IV
D. I, III and IV

24. Which of the following is **not** a conductor of electricity?

A. Human body
B. Earth
C. Water
D. Copper

25. A motorist starts from rest and moves with a constant acceleration of $0.5m/s^2$. How long will it take the motorist to cover a distance of 25m?

A. 2.5 sec.
B. 10.0 sec.
C. 50.0 sec.
D. 100. sec.

26. Which of the following is correct about light and sound waves?

A. Both of them need material medium for propagation.
B. Both of them are longitudinal waves.
C. Both of them are associated with energy transfer.
D. Both of them can be polarized.

27. What is the mass of 7.5 liters of water? [Density of water = $1g/cm^3$]

A. 75kg
B. 750kg
C. 7,599kg
D. 75,000kg

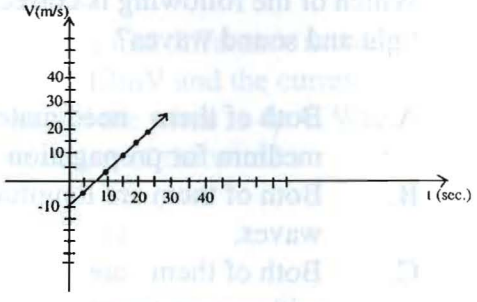
28. Whenever light passes from air into glass, its speed in the glass

A. increases.
B. remains constant but its direction changes.
C. remains constant in magnitude and direction.
D. decreases.

29. The power of a lens is measured in

A. radian per meter.
B. radian per second.
C. watt.
D. watt per squared centimeter.

*Use the diagram below to answer questions **30 to 32**.*



30. The direction of the motion at 1.0 second

A. reverses.
B. is downward.
C. remains the same.
D. is in the opposite direction.

31. What is the average velocity from 0.5 second to 1.5 seconds?

A. 10m/.s
B. 5m/s.
C. 3m/s.
D. 0m/s.

32. What is the displacement between 0.0 second and 1.0 second?

A. -10m
B. -5m
C. 5m
D. 10m

33. Which of the following is the reason for which a concrete floor feels colder to the bare feet than a mat on the same floor during a rainy day?

A. The mat is a better conductor of heat than the concrete floor.
B. The mat loses heat to the bare feet at a faster rate than the concrete floor.
C. The mat loses heat to the bare feet while the concrete floor absorbs heat from them.
D. The concrete floor is a better conductor of heat than the mat.

34. A refrigerator consumes electricity energy at the rate of 2,000W. If the cost of electricity is $0.05 per kilowatt hour, calculate the cost of operating the appliance for 30 days.

A. $7.20
B. $12.00
C. $30.00
D. $72.00

35. Two similar electric charges will always

A. attract each other.
B. repel each other.
C. polarize each other.
D. destroy each other.

36. If the temperature of water is gradually increased from 0°C to 4°C, the density of the water within this range

A. increases for a while and then decreases.
B. decreases for a while and then increases
C. decreases gradually.
D. increases gradually.

37. What is the angular velocity of the second hand of a clock?

A. 1.05×10^{-1} rad/sec.
B. 1.1 x 10-2 rad/sec.
C. 10.5 rad/sec
D. 2.05×10^{-1} rad/sec.

38. A change in the frequency of a wave as the result of an object's relative motion is called

A. Doppler effect.
B. damping.
C. pitch effect.
D. amplitude effect.

39. A simple pendulum has a length of 405cm and executes 10 complete vibrations in 50 seconds. What is the approximate value of the acceleration due to gravity of the place where the pendulum is located? [use π = n3.14]

A. $6.40 m/s^2$
B. $6.40 cm/s^2$
C. $2.03 m/s^2$
D. $2.03 cm/s^2$

40. Newton's first law of motion is also known as th elaw of

A. inertia.
B. acceleration.
C. interaction.
D. reaction.

41. A 55W light bulb is connected to a potential difference 1.10×10^{2}V. What is its resistance?

A. 0.5Ω
B. 22.2Ω
C. 220.0Ω
D. 500.0Ω

42. Kilogram is to mass as Hertz is to

A. Frequency.
B. Inductance.
C. Wavelength.
D. Magnetic flux density.

43. A girl whose mass is 55kg stands on a spring weighing machine inside a lift. When the lift starts to ascend, its acceleration is 2m/s2. What will be the reading of the girl's mass on the machine?

A. 44kg
B. 55kg
C. 66kg
D. 110kg

44. The decay rate of a radioactive substance is represented by its

A. quantum number.
B. atomic mass.
C. atomic number.
D. half-life.

45. Which theory states that "heat is an invisible fluid"?

A. Thermo theory
B. Kinetic theory
C. Specific heat theory
D. Caloric theory

46. What is the capacitance of two 6μf capacitors that are conected in series?

A. 12μ f
B. 9μf
C. 3μf
D. 2μf

47. What is the actual mechanical advantage of a machine whose output force doubles its input force?

A. 4
B. 2
C. 0.5
D. 0.25

48. Calculate the potential energy of a 10kg object the is placed at a height of 50cm.

A. 5,000j
B. 500j
C. 50j
D. 5j

49. A boy throws a stone in the air with a velocity of 20m/s. How long will the stone stay in the air?

A. 2 seconds
B. 3 seconds
C. 4 seconds
D. 5 seconds

50. The actual difference between an observed value and the accepted value during measurement is known as

A. absolute deviation.
B. absolute error.
C. relative deviation.
D. relative error.

END OF OBJECTIVE TEST

DO NOT TURN OVER THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

YOU WILL BE PENALIZED SEVERELY IF YOU ARE FOUND LOOKING AT THE NEXT PAGE BEFORE YOU ARE TOLD TO DO SO.

PAPER 2

ESSAY 1½ hours

[60 marks]

*Paper 2 consists of **seven** questions divided into **two** sections, **A &B**. Section A has **three** compulsory questions and Section B has **four** questions of which you are required to answer any **two**.*

*Write you answer in **ink** (blue or black)*

For each question, all necessary details of working including diagrams must be shown with the answer.

*Use **g = 10m/s²** where necessary.*

Credits will be given for clarity of expression and orderly presentation of material.

SECTION A
(COMPULSORY)
[24 marks]

*Answer **all** questions in this section*

1. *(a)* The conditions affecting the frequency of a vibrating string are summarized into four basic laws of strings. State any **three** of these laws.

(b) A Pastor fasting and praying loses 2.5kg per week. Express the mass loss in milligram per second.

2. *(a)* By equating the photon energy equation, E = hf, and the Einstein's mass-energy equation,deduce an expression for the resulting wavelength of a particle.

(b) Define and give an example each of the following.

(i) Luminous object

(ii) Illuminated object

(iii) Incandescent object.

(a) *Complete the chart below by providing the causes and correction of the following defect of vision.*

	Defect	Cause(s)	Correction
i	Astigmatism		
ii	Hypermetropia		
iii	Myopia		
iv	Presbyopia		

(b) State **four** advantages of friction.

SECTION B
[36 marks]

Answer any two questions in this section.

(a) A machine of velocity ratio 4 requires 2kj of energy to lift a 600N load through a vertical distance of 25m. Calculate the

(i) efficiency of the machine.

(ii) mechanical advantage.

(iii) effort needed to lift the load.

(b) Two forces of magnitudes 2N and 3N respectively act on a point P at an angle of inclination of 60° to each other. With the aid of a suitable force diagram, determine the magnitude and direction of the resultant force.

(a) List the determining factors of the **period** of a simple pendulum

(b) An UNMIL patrol car increases speed from rest and in 20 seconds reaches a speed of 54km/h. Calculate the

(i) uniform acceleration in m/s2.

(ii) distance travelled during this time.

(c) State any **three** reasons why water is **not** used as a thermometer liquid.

6. *(a)* Upon what factors does the resistance of a wire depend?

(b) An electrical circuit has a parallel connection of three resistors of resistances 6.0Ω, 9.0Ω, and 18.0Ω to a voltage source. Through the 9.0Ω resistor, a current of 4.0A flows.

(i) Draw a diagram of the circuit.
(ii) Calculate the voltage output of the source.
(iii) Calculate the current in the other resistors.
(iv) What is the equivalent resistance?

7. *(a)* Explain the following:
(i) Specific latent heat of fussion
(ii) Specific latent heat of vaporization
(iii) Specific heat capacity

(b) Account for the formation of the following:

(i) fog
(ii) dew
(iii) mist.

END OF TEST