403 S. H. S. C. E.
MAY 2012
PHYSICS **1&2**
Objective and Essay Tests
2½ hours

Name:.....

Identification Number: .....

THE WEST AFRICAN EXAMINATIONS COUNCIL

Senior High School Certificate Examination

May 2012 — **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 male candidate whose *name* is Michael J. GAYFLOR. His *identification number* is 101123456, his first entry is in 2012 and he is offering *PHYSICS.*

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SOMAH TAMBA INSTITUTE	500104
CENTER NAME	CENTER No.
TUKPEI PREPARATORY SCHOOL	101123
SCHOOL NAME	SCHOOL No.
GAYFLOR, MICHEAL J.	456
STUDENT NAME	STUDENT No.
PHYSICS	12TH
SUBJECT	GRADE

IDENTIFICATION NUMBER

1	⇦	■	⇦	⇦	⇦	⇦	⇦	⇦	⇦	⇦
0	■	⇦	⇦	⇦	⇦	⇦	⇦	⇦	⇦	⇦
1	⇦	■	⇦	⇦	⇦	⇦	⇦	⇦	⇦	⇦
1	⇦	■	⇦	⇦	⇦	⇦	⇦	⇦	⇦	⇦
2	⇦	⇦	■	⇦	⇦	⇦	⇦	⇦	⇦	⇦
3	⇦	⇦	⇦	■	⇦	⇦	⇦	⇦	⇦	⇦
4	⇦	⇦	⇦	⇦	■	⇦	⇦	⇦	⇦	⇦
5	⇦	⇦	⇦	⇦	⇦	■	⇦	⇦	⇦	⇦
6	⇦	⇦	⇦	⇦	⇦	⇦	■	⇦	⇦	⇦

YEAR OF FIRST ENTRY

2	⇦	⇦	■	⇦	⇦	⇦	⇦	⇦	⇦	⇦
0	■	⇦	⇦	⇦	⇦	⇦	⇦	⇦	⇦	⇦
1	⇦	■	⇦	⇦	⇦	⇦	⇦	⇦	⇦	⇦
2	⇦	⇦	■	⇦	⇦	⇦	⇦	⇦	⇦	⇦

SUBJECT CODE

4	⇦	⇦	⇦	⇦	■	⇦	⇦	⇦	⇦	⇦
0	■	⇦	⇦	⇦	⇦	⇦	⇦	⇦	⇦	⇦
3	⇦	⇦	⇦	■	⇦	⇦	⇦	⇦	⇦	⇦

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

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

PAPER 1

OBJECTIVE TEST

[40 marks] 1 h

Answer **all** *the questions*
Paper **1** *consists of* **fifty** *questions. Each question is followed by* **four** *options lettered* **A-D**.
Determine the correct option for each question and shade in ***pencil*** *on your answer sheet, the answer space which bears the same letter as the option you have chosen. Give only* ***one*** *answer to each questi*
An example is given below.
Where necessary, ***use g=10m/s2***

What is the S.I. unit of length?
A. Kilogram
B. Meter
C. Mole
D. Coulomb

The correct answer is ***meter*** *which is lettered* ***B,*** *and therefore the answer space* ***B*** *would be shaded* =A= =B= =C= =D=

Think carefully before you shade the answer space; erase completely any answer you wish to change. Do all rough work in this question paper. Now answer the following questions.

1. As an object falls freely, its kinetic energy
   A. decreases.
   B. increases.
   C. remains the same.
   D. is zero.

2. All of the following are scalars **except**
   A. energy.
   B. mass.
   C. momentum.
   D. power.

3. Which of the following is **not** associated with sound wave?
   A. Polarization
   B. Amplitude
   C. Wavelength
   D. Period

4. The area under a velocity versus time graph represents
   A. acceleration.
   B. displacement.
   C. momentum.
   D. speed.

5. The SI prefix used to designate one million is

   A. mega
   B. milli-
   C. micro-
   D. nano-

6. Which of the following electromagnetic radiation has the **least** energy per photon?

   A. Gamma ray
   B. Infra-red radiation
   C. X-ray
   D. Radio wave

7. The period of a system undergoing simple harmonic motion is T. If the amplitude of the system's motion is doubled, its period becomes

   A. T/4.
   B. T/2.
   C. T.
   D. 2T.

8. A radioactive element has a half-life of 4 hours. Approximately how much of the radioactive element will remain after 12 hours?

   A. 1/16
   B. 1/8
   C. 1/6
   D. 1/4

9. The force of repulsion between two point charges is 0.36N when their separation is 1.5m. What force do they exert on each other when the separation is 1.0m?

   A. 0.81N
   B. 0.54N
   C. 0.24N
   D. 0.16N

10. If the sum of all the forces acting on a moving body is zero, the body will

    A. slow down and stop.
    B. change the direction of its motion.
    C. accelerate uniformly.
    D. continue moving with constant velocity.

11. A spring scale reads 20N as it pulls a 5kg mass across a table. What is the magnitude of the force exerted by the mass on the spring scale?

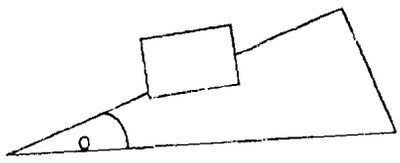
    A. 40N
    B. 20N
    C. 5N
    D. 3N

12. Moving a 2.5μc of charge from point A to point B in an electric field requires 6.3 x 10^{-4}j of work. What is the approximate potential difference between the two points?

    A. 1.6×10^{-9} volts
    B. 4.0×10^{-3} volts
    C. 2.5×10^{-2} volts
    D. 1.0×10^{-4} volts

Turn over

Use the diagram below to answer question **13.**



13. As the angle □ is increased,the coefficient of kinetic friction between the surface of the block and the inclined plane will

    A. decrease.
    B. increase.
    C. remains the same.
    D. not exist.

14. A force **F** directed at an angle **θ** above the horizontal is used to pull a load a distance **d** across a level floor. The work done by the force **F** is

    A. Fd
    B. Fdcosθ
    C. Fdsinθ
    D. mgcosθ

15. What does X represent in the below nuclear equation?
    ${}^{2}_{1}H + {}^{2}_{1}H \rightarrow {}^{2}_{1}He + X$

    A. Alpha particle
    B. Beta particle
    C. Gamma particle
    D. Neutron

16. A motor cyclist traveled at a speed of 100 kilometer per hour. What is the speed in mile per hour? [1 mile = 1.6km]

    A. 26.5mph
    B. 62.5mph
    C. 625mph
    D. 725mph

17. Two objects, A and B, accelerate from rest at the same uniform rate. Object B accelerates twice as Object A. Compared to Object A, Object B will travel.

    A. twice as far.
    B. three times further.
    C. four times further.
    D. at the same rate.

18. The distance between a crest and an adjacent trough of a wave is

    A. the wave's amplitude.
    B. one-half the wave's amplitude.
    C. the wave's wavelength.
    D. one-half the wave's wavelength.

19. The velocity of propagation of a transverse wave on a 2-meter long tube opened at both ends is 200m/s. What is the tube's fundamental frequency?

    A. 25Hz
    B. 50Hz
    C. 100Hz
    D. 200Hz

20. Keeping all other factors constant, as the atmospheric pressure increases, the velocity of sound

    A. increases.
    B. decreases.
    C. is zero.
    D. does not change.

21. Three identical capacitors are connected in series to a battery. If a charge **Q** flows from the battery, how much charge does each capacitor carry?

A. Q/3
B. Q
C. 3Q
D. 6Q

22. If the resistance in a constant voltage circuit is doubled, the power dissipated by the circuit will

A. increase by a factor of two.
B. increase by a factor of four.
C. decrease to one-half the original value.
D. decrease to one-fourth the original value.

23. A current of 22A flows into a parallel combination of a 4Ω, 6Ω and 12Ω resistors. What current flows through 12Ω resistor?

A. 2.56A
B. 3.66A
C. 7.33A
D. 18A

24. Electromagnetic waves are

A. longitudinal in nature.
B. transverse in nature.
C. both longitudinal and transverse in nature.
D. neither longitudinal nor transverse in nature.

25. What is the power of a lens whose focal length is 5cm?

A. 0.1
B. 0.2
C. 5.0
D. 50.0

26. A step-down transformer has a term ratio of 0.025. If the primary voltage is 200V, what is the value of the secondary voltage?

A. 5V
B. 6V
C. 12V
D. 60V

27. Vectors are added graphically by placing them

A. tail to tail.
B. head to head.
C. head to tail.
D. parallel.

28. A plane flies 300km due north, then 400km due east. What is the magnitude of its displacement?

A. 100km
B. 500km
C. 700km
D. 1000km

29. A net force **F** acts on mass **m** and produces an acceleration **a.** What acceleration will result if a force **8F** acts on a mass **4m**?

A. 2a
B. 4a
C. 8a
D. 32

Turn over

30. The centripetal force responsible for holding a car in a frictionless banked curve is the

A. horizontal component of the car's weight.
B. vertical component o the car's weight.
C. horizontal component of the normal force.
D. vertical component o the normal force.

31. Which of the following will **not** change the fundamental frequency of a stretched wire?

I. Increasing the amplitude of vibration
II. Changing the length of the wire.
III. Changing the tension in the wire

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

32. Two colors of light are projected onto a screen so that they overlap. Which of the following is **not** true about the overlapping?

A. Red + blue = magenta
B. Red + green = yellow
C. Cyan + red = white
D. Blue + yellow = green

33 In an astronomical telescope, the objective lens should be

A. concave with short focal length.
B. concave with long focal length.
C convex with short focal length.
D. convex with long focal length

34 A closed organ pipe has a frequency of 600Hz. What is the frequency of its first octave?

A 200Hz
B 600Hz
C 1200Hz
D. 1800Hz

35. A stone of weight 0.70N appears to weigh 0.50N in water and 0.55N in a liquid. Calculate the relative density of the liquid.

A. 0.15
B 0.20
C. 0.75
D. 1.30

36. All of the following are primary sources of energy **except**

A. coal.
B electricity.
C. oil.
D. sun.

37 The penetration of one type of particle into a mass consisting of a second type of particle is called.

A. diffusion.
B tensile strength
C adhesion
D. convection

38. Which of the following will change if the size of the pinhole in a pinhole camera is increased?

A. Size of the image
B. Sharpness of the image
C. Color of the image
D. Shape of the image

39. On the surface of the earth, a one-kilogram mass weights

A. 2.2N
B. 4.0N
C. 10.0N
D. 50.0N

Use the situation below to answer questions ***40-42.***

A ball of mass 0.5kg released from a height of 20 meters above the ground rebounds to a height of 5 meters. The ball is in contact with the ground for 0.1 second.

40. What is the velocity of the ball just before striking the ground?

A. 40m/s
B. 20m/s
C. 15m/s
D. 10m/s

41. What is the force on the ball as it falls?

A. 20N
B. 10N
C. 7.5N
D. 5N

42. Calculate the potential energy of the ball at the rebound height.

A. 25j
B. 75j
C. 100j
D. 125j

43. When working, a 120W, 240V lamp has a resistance of

A. 480Ω.
B. 240Ω.
C. 130Ω.
D. 60Ω.

44. An object with mass $\mathbf{m_1}$ makes a head-on elastic collision with a stationary object of mass $\mathbf{m_2}$. After the collision, both objects moved in the same direction as $\mathbf{m_1}$. Which is **true**?

A. M_1 is greater than m_2.
B. M_2 is greater than m_1.
C. M_1 is equal to m_2.
D. No relationship exists.

45. How many kilocalories of heat are required to raise the temperature of 750g of water from 35°C to 55°C?
[c = 1.00cal./g°C]

A. 15,000
B. 1,500
C. 150
D. 15

46. Two point charges are separated by a distance **d** and fee a force **F**. What would be the force if the two charges are moved a distance **d/3** apart?

A. 3F
B. F/3
C. 9F
D. F/9

Turn over

47. A capacitor is charged to a 90V battery and receives a charge of 3.0μc. What is the capacitance of the capacitor?

A. 0.33μf
B. 2.00μf
C. 27.00μf
D. 270.00μf

48. How many significant digits are there in the product of 0.0028 and 1.7?

A. two
B. three
C. four
D. five

49. The angle between two inclined plane mirrors is 15 degrees. How many images of an object placed between the mirrors would be formed?

A. 24
B. 23
C. 12
D. 11

50. As a solid melts.

A. its temperature increases.
B. its temperature decreases.
C. heat leaves the solid.
D. heat enters the system.

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

[60 marks] **1½ hours**

Paper **2** *consists of* **two** *sections,* **A** *&* **B**. *Section* **A** *consists of* **three** compulsory *questions and section* **B** *consists of* **four** *questions of which you are required to answer any* **two**. *Write your answer in* **ink only** {blue or black}.

For each question, all necessary details of working including rough work and diagrams must be shown with the answer. Credit will be given for clarity of expression and orderly presentation of materials.

SECTION A
{COMPULSORY)
[24 Marks]

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

1. Complete the table below by providing the standard form and number of significant digits of each number.

S/N	Number	Standard Form	Number of significant digits.
a	0.0000847		
b	0.30080		
c	4.820,000		
d	0.734		
e	37,000,000		
f	2,473.0		
g.	978		
h	170,000		

2. In a laboratory experiment, a Science Club measures the mass of a piece of iron on a balance for three trials and obtained the following values: 14.25g, 14.5g, and 13.95g. The mass of the piece of iron is stamped 14.0g. Calculate the percent deviation of this experiment.

3. What is the difference between 10°C and 10C°?

SECTION B

[36 Marks]

Answer any **two** questions *in this section.*

4. (a) Convert the following angular displacements to radians.
   (i) 160 revolutions
   (ii) 235 degrees.

   (b) Can an object with a large mass and one with a small mass have the same momentum? Explain.

   (c) List **four** factors that affect evaporation.

5. (a) In a laboratory experiment, a Physics student discovers that a tuning fork of frequency 300Hz will produce the best frequency with a closed tube of diameter 5cm. When the length of the tube is 25cm,
   (i) what will be s the speed of the sound produced?
   (ii) what is the temperature in the laboratory on that day?

   (b) A battery consists of three cells connected in series, each with an emf of 2.5V and an internal resistance of 0.25Ω. If a 6.50 Ω load is connected across the battery,
   (i) what is the magnitude of the circuit current?
   (ii) calculate the potential difference across the load.
   (iii) draw a diagram of the circuit.

6. (a) Construct a ray diagram locating and identifying the image of an object placed
   (i) between the principal focus and the pole of a converging mirror.
   (ii) in front of a convex mirror.

   (b) Describe the **three** classes of lever and give **two** examples each.

   (c) A boy sliding on a hill accelerates at 1.4m/s2. If he started from rest, in what distance would he reach a speed of 7.0m/s?

7. A 650N boy and a 490N girl sat on a 150N pole that is 1.7m long. If the pole is supported at both ends by their mother and father respectively, what is the reactions of the mother and father at the supports when the boy sits 0.75m from one end and the girl is 0.5m from the other?

END OF PAPER