Name ....

Indentification Number.......................................

THE WEST AFRICAN EXAMINATIONS COUNCIL

Senior High School Certificate Examination

PHYSICS

May 2010   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 spaces provided above.*
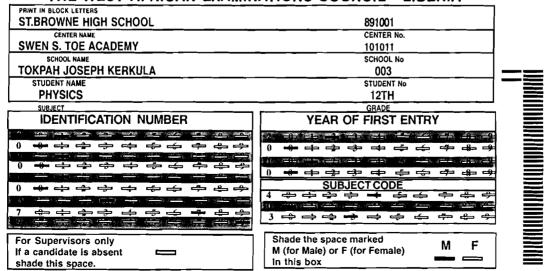
This paper consists of two parts: Paper 1 and 2. Answer Paper 1 on your Objective Test answer sheet and Paper 2 in your Answer booklet. Paper 1 will last 1 hour after which the answer sheet will be collected. Do not start Paper 2 until you are told to do so. Paper 2 will last 1½ hours.

PAPER 1
OBJECTIVE TEST
[40 marks]   1 hour

1. Use **2HB** 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 Joseph Kerkula TOKPAH. His *identification number* is 101011379, his first entry is in 2010 and he is offering *Physics.*

THE WEST AFRICAN EXAMINATIONS COUNCIL - LIBERIA

PRINT IN BLOCK LETTERS	
ST.BROWNE HIGH SCHOOL	891001
CENTER NAME	CENTER No.
SWEN S. TOE ACADEMY	101011
SCHOOL NAME	SCHOOL No
TOKPAH JOSEPH KERKULA	003
STUDENT NAME	STUDENT No
PHYSICS	12TH
SUBJECT	GRADE

IDENTIFICATION NUMBER

0
0
0
7

YEAR OF FIRST ENTRY

0
0

SUBJECT CODE

4
3

For Supervisors only If a candidate is absent shade this space.	Shade the space marked M (for Male) or F (for Female) In this box M F

Answer **all** *questions*   **1 hou**

There are **fifty** *questions in this the test. Each question is followed by* **four** *options labeled* **A to D**. *Determin the correct option for each question and shade in* **pencil** *on your answer sheet the answer space which bea the same letter as the option you have chosen. Give only* **one** *answer to each question. Where necessary, us*
$g = 10m/s^2$.

An example is given below.

Which of the following instruments is used to measure the mass of an object?
A.   Beam balance
B.   Spring balance
C.   Vernier caliper
D.   Micro-meter screw guage

The correct answer is Beam balance, which is labeled A and therefore answer space A would be shaded.
            [A] |B| |C| |D|

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.   The agreement among several measurements that are made in the same way is called
      A.   precision.
      B.   deviation.
      C.   consistency.
      D.   accuracy.

2.   The work done per unit charge is known as
      A.   potential difference.
      B.   potential energy.
      C.   power.
      D.   resistance.

3.   The motion that repeats itself is referred to as
      A.   random motion.
      B.   periodic motion.
      C.   rectilinear motion.
      D.   translational motion.

4.   The result of two periodic waves of the same frequency which are in phase and are traveling in the same direction is called
      A.   constructive interference.
      B.   complete interference.
      C.   destructive interference.
      D.   periodic interference.

5.   Which law states that the mass of an element deposited or liberated during electrolysis is proportional to the chemical equivalent of the element?
      A.   Hooke's Law
      B.   Joule's Law
      C.   Faraday's Law
      D.   Snell's Law

6.   Which device in an electric circuit makes it possible for the movement of charges in the circuit?
      A.   Voltmeter
      B.   Ammeter
      C.   Seal of electromotive force
      D.   Resistor

7.   Circulate the velocity of two bodies A with respect to B if the two bodies move with velocities 10m/s NW and 15m/s SE respectivelty.
      A.   15m/s SE
      B.   15m/s NE
      C.   5m/s SE
      D.   5m/s NE

8.   How much charge can a 2μf capacitor store if the potential difference across it is 240 volts?
      A. $2.0 \times 10^{-7}C$
      B. $2.88 \times 10^{-3}C$
      C. $3.45 \times 10^{-6}C$
      D. $4.80 \times 10^{-4}C$

9. A net force of 15N acts on a 3kg body for 5 seconds. What is the change in the speed of the body?
   A. 1.0m/s
   B. 2.5m/s
   C. 9.0m/s
   D. 25.0m/s

10. Which atomic particle is used to cause fission in an atomic reactor?
    A. Alpha particle
    B. Beta particle
    C. Neutron
    D. Proton

11. A ball of mass 8kg is allowed to fall freely from rest. Neglecting air resistance, calculate the kinetic energy of the ball after falling for 3 seconds.
    A. 240j
    B. 1,200j
    C. 3,600j
    D. 7,200j

12. If 20 oscillations were completed in 38 seconds in a simple pendulum experiment, what is the period of oscillation of the pendulum?
    A. 1.9s
    B. 18s
    C. 58s
    D. 760s

13. 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. 4.00
    B. 2.00
    C. 0.75
    D. 0.50

14. A motorist traveling at 20m/s on a straight road suddenly sees a rock 40m away in the middle of the road. Calculate the minimum braking force he needs in order not to hit the rock if the mass of the car is 1000kg..
    A. 250N
    B. 5000N
    C. 8000N
    D. 10,000N

15. The speed of sound in air is directly proportional to the
    A. temperature of the thermodynamic scale.
    B. temperature on the Celsius scale.
    C. square root of the temperature on the Celsius scale.
    D. cube root of the temperature on the Celsius scale.

16. A water pump is used to pump 120kg of water to a height of 4m in one minute. What is the power output of the pump?
    A. 80W
    B. 84W
    C. 200W
    D. 4,800W

17. Beams of blue light and yellow light shine onto the same region of a white screen. When this happens the region then appears
    A. black.
    B. green.
    C. magenta.
    D. white.

18. The superposition principle of wave states that when two or more waves travel simultaneously through the same medium, each wave proceeds
    A. independently as though other waves were present.
    B. dependently as though no other waves were present.
    C. independently as though no other waves were present.
    D. dependently as though other waves were present..

19. At 100°C, what will be the volume of mercury that is 1cm^3 at 0°C? [Use ß = 1.82 x 10^{-4}/°C]
    A. 1.82 x 10^{-3}cm^3
    B. 1.01cm^3
    C. 1.02cm^3
    D. 1.2 x 10^{-2}cm^3

20. Which of the following electromagnetic radiations has the highest frequency?
    A. Gamma rays
    B. X-rays
    C. Beta particle
    D. Alpha particle

Turn over

21. 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..

22. How many times larger than a millimeter is a kilometer?
    A. One thousand times
    B. Ten thousand times
    C. One million times
    D. Ten million times

23. A diver is 5.2m below the surface of water of density 1,000kg/m^3. If the atmospheric pressure is 1.02 x 10^5 pa,, calculate the pressure on the diver.
    A. 6.20 x10^{5}pa
    B. 5.20 x 105pa
    C. 1.64 x 10^{5}pa
    D. 1.54 x10^{5}pa

24. The tube of a microscope is 16cm long. If the focal length of the eyepiece is 30mm and the focal length of the objective is 50mm, what is the magnifying power of the microscope?
    A. 266.7
    B. 50.0
    C. 26.7
    D. 1.57

25. A body of weight 10N is immersed in a fluid and displaces a quantity of the fluid. If the weight of displaced fluid is 6N, what is the up thrust on the body?
    A. 4N
    B. 6N
    C. 10N
    D. 20N

26. Three capacitors of 3.00µf, 6.00µf and 9.00µ respectively are connected in parallel to a battery of 50.0V. What is the total charge on the parallel combination?
    A. 18.0µC
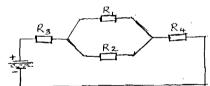   B. 9.00µC
    C. 9.00 x10^{-4}C
    D. 1.80 x10^{5}C

27. A velocity selector has a magnetic field of 3.00 x10^{-4}T and an electric field of 4.50N/C. What velocity does it select?
    A. 1.50 x 10^{4}m/s
    B. 6.67 x10^{-4}m/s
    C. 1.50 x 10^{4}m/s
    D. 6.67 x10^{4}m/s

28. Which of the following has the longest wavelength?
    A. Microwaves
    B. Radio waves
    C. Sound waves
    D. Ultraviolet waves

29. In a hydraulic lift, a force of 200N is applied to a piston of area 0.2m^2. If the area of the other piston is 2m^2, calculate the force exerted on it.
    A. 20N
    B. 40N
    C. 80N
    D. 2000N

30. The force on a charge of 0.2C in a uniform electric field is 4.0N. What is the magnitude of the electric field intensity?
    A. 0.05N/C
    B. 2.00N/C
    C. 8.00N/C
    D. 20.00N/C

31. What do isotopes have in common?
    A. Number of protons
    B. Number of electrons
    C. Number of neutrons
    D. Mass number

32. The air from an air conditioner is felt by everyone sitting in a car. The property of wave demonstrated is
    A. diffraction.
    B. reflection.
    C. refraction.
    D. rectilinear propagation.

33. Which the following can accelerate an electron but never changes its speed?
    A. Magnetic field
    B. Electric field
    C. Frictional field
    D. Gravitational field

34. An ideal transformer has a current of 2.0A and a p.d of 120V across the primary coil. If the current in the secondary coil is 0.5A, the potential across the secondary coil will be

A. 30V.
B. 60V.
C. 120V.
D. 480V.

35. A given mass of gas is kept at constant pressure. If its volume at 0°C is 273cm³, what is its volume at 280°C?

A. 553cm³
B. 540cm³
C. 291cm³
D. 280cm³

36. A charge moving at 2,400m/s in a magnetic field of 2000T experiences a force of 0.2N. What is the magnitude of the charge?

A. 41nC
B. 0.167C
C. 0.24C
D. 24MC

37. All of the particles in the nucleus of an atom are collectively called

A isotopes.
B. nucleons.
C. neutrons.
D. protons.

38. A sound wave of frequency 1.2kH is reflected from a barrier 75m away and is received 0.5 seconds after transmission. Calculate the wavelength of the sound waves.

A. 0.0625m
B. 0.125m
C. 0.250m
D. 4.00m

39. A body which transmits light because of its heat is said to be

A. fluorescent.
B. transparent.
C. incandescent.
D. translucent.

40. Determine the capacitance of two 6μf capacitors that are connected in series.

A. 2μf
B. 3μf
C. 9μf
D. 12μf

41. The lead-acid accumulator consists of

A. lead as the positive electrode.
B. hydrochloric acid as the electrolyte.
C. lead oxide as the negative electrode.
D. tetraoxosulphate(VI) acid as the electrolyte.

42. An object 5cm high is placed 35cm in front of a converging lens of focal length 10cm. Where is the image located?

A. 0.13cm
B. 2.50cm
C. 7.78cm
D. 14.00cm

43. How many significant digits are there in 0.0070020?

A. 4
B. 5
C. 6
D. 7

Use the diagram below to answer question 44.
$R_1 = 1\Omega$, $R_2 = 4\Omega$, $R_3 = 3\Omega$ and $R_4 = 5\Omega$

44. What is the effective resistance of the circuit?

A. 8.80Ω
B. 7,25Ω
C. 5.00Ω
D. 4.75Ω

45. A machine is used to carry a 600N load through a distance of 20m. If the work done by effort in moving the load is 16kj, what is the efficiency of the machine?

A. 40%
B. 65%
C. 75%
D. 85%s

Turn over

46. Which of the following has the **greatest** penetrating power?
   A. Alpha rays
   B. Beta rays
   C. Gamma rays
   D. X-rays

47. All of the following are primary colors of light **except**
   A. blue.
   B. green.
   C. red.
   D. yellow.

48. A reservoir is filled with liquid of density $2,000kg/m^3$. Calculate the depth at which the pressure will be $9,100N/m^2$.
   A. 0.819m
   B. 0.46m
   C. 0.32m
   D. 0.25m

49. What is the focal length of a concave mirror whose radius of curvature is 7cm?
   A. 3.5cm
   B. 5.0cm
   C. 10.0cm
   D. 14.0cm

50. Electric motor primarily converts electrical energy into
   A. heat energy.
   B. chemical energy.
   C. potential energy.
   D. mechanical energy.

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]

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

*Write your answer in **ink** (blue or black) **only**.*

*For each question, all necessary details of working including diagrams must be shown with the answer. Use $g = $ **10m/s^2** 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*) In a tabular form, state at **least two** differences each between
2.

        (*i*)   boiling and evaporation.

        (ii)   diffused and regular reflections of light.

    (*b*) Complete the table with the correct SI unit or quantity.

	Quantity	SI Unit
i		farad
ii	Electric current	
iii	Magnetic flux	
iv		Henry
v		Watt
vi	Amount of substance	
vii		Coulomb
viii	Luminous intensity	

2. (a) Mathematically, state the following laws:
      (i)   Joule's Law
      (ii)   Coulomb's Law of electrostatics.
      (iii)   Robert Boyle's Law.

(iv)   Snell's Law.

(b)   Why is the efficiency of an ideal machine always less than 100%?

3.   (a)   Is it possible for a moving body to be in equilibrium? If yes, justify your answer by an example, if no, why?.

(b)   An athlete in a race runs along a 0.05km track. For every 10m along the track, an observer with a stop-watch is posted. The athlete begins to run at the sound of a whistle while the observers start their stop-watches at the same instant. Each observer stops his stop-watch as the athlete passes him. After one trial run, the stop-watches of the observers read the following as indicated in the table below.

Observer	1	2	3	4	5
Time/sec.	1.0	2.5	4.0	5.5	6.0

(i)   Construct a position- time graph for the athlete's motion with respect to the observers.

(ii)   What is the athlete's average speed for the journey?

(iii)   Calculate the average speed of the athlete for the first 30m.

SECTION B
[36 marks]

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

4..   (a)   A radioactive isotope decreases in mass from 128g to 4g in 24 days. What is the half-life of the radioactive substance?

(b)   A 60,000g load is pushed up a smooth plane inclined at 30° to the horizontal. What is the work done
    (i)   given the length of the plane is 0.05km.?
    (ii)   if the load comes to rest at a vertical height of 20m above the ground.?

5.   (a)   A force of 2.4N is applied tangentially to the rim of a 0.60kg disk of diameter 19.0cm. Calculate the resulting angular acceleration in m/s^2 of the disk.

(b)   State the first law of photoelectric emission.

(c)   *You have three capacitors of capacitances 2μf each.*

    (ii)   Draw **three** possible circuit diagrams of the capacitors.
    (iii)   Calculate the equivalent capacitance for each combination.

6.   (a)   A rectangular solid iron block has dimensions 1.0m x 0.8m x 0.5m and rests on a horizontal flat table. Given the density of the iron as $8000kg/m^3$, calculate the minimum and maximum pressure which the block can exert on the surface of the table. [**Use 1kg mass = 10N weight**]

(b) A 30Ω resistor is connected in parallel to a 15Ω resistor. These are connected in series to a 5Ω resistor and a source with an emf of 30V.

(i) Draw a circuit diagram.

Calculate the
(ii) total resistance.
(iii) voltage drop across each resistor.
(iv) current through each resistor.

'. (a) An object 20cm tall is placed before a converging mirror of radius of curvature 20cm produces a virtual image 30cm behind the mirror.

Calculate the
(i) object distance from the mirror.
(ii) magnification..
(iii) image height

(b) A proton is placed in an electric field at a point where the field intensity is 1300N/C. Calculate its acceleration. [mass of proton is 1.67 x 10^{-27}kg]

(c) A 12kg object is pulled upward with an acceleration of 3m/s^2 by a massless rope. What is the tension in the rope?

(d) How much heat is produced in a minute by an electric iron which draws 5.0A of current when connected to a 100-volt supply?

END OF TEST