Surname	Other Names

Centre Number	Candidate's Number

THE WEST AFRICAN EXAMINATIONS COUNCIL
West African Senior School Certificate Examination (WASSCE)
for Private Candidates, 2020 - First Series

(PC1) 2020   PHYSICS 2 $1\frac{1}{2}$ hours
[60 marks]

Instructions to Candidates

Write your **surname, other names, centre number** *and* **candidate's number** *in the spaces provided at the top of this paper.*

Please **note** *that your* **names** *should be written in the order in which they were captured during registration.*

*In addition to writing your name on the front page of your booklet, write your full name in the area provided at the top of pages 3, 5, 7, 9, 11, 13 and 15 in the designated space "***Candidate's Name:...***"*

Answer any **five** *questions from* PART I *which carry* **3** *marks* **each,**

and any **three** *questions from* PART II *which carry* **15** *marks* **each.**

Write boldly and legibly in **ink** *(blue or black) and state your answers precisely.*

Use **2B** *pencil to draw where necessary.*

Write your answers within the spaces provided.

Do **not** *write answer(s) beyond the spaces provided for the question(s).*

Do **not** *write* **more than one** *answer on a line.*

Do **not** *write on the bar codes at the bottom of the pages.*

Do **not** *tear off any part of this booklet. It is an examination malpractice if you do so.*

For Examiner's Use Only	
Question No.	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
Total	

ESSAY

[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 physical quantity Q is given by the expression $Q = \frac{1}{2} \rho v^2$, where ρ is density and v is velocity.

   (a) Determine the dimensions of Q.

   _____

   _____

   _____

   (b) What physical quantity does Q represent?

   _____

   _____

   [3 marks]

2. A missile is to be launched such that it drops in an enemy's camp. If the **maximum** horizontal distance between the point of launch and the enemy's camp is 7200 *km*, at what speed should the missile be launched so that it lands in the camp?
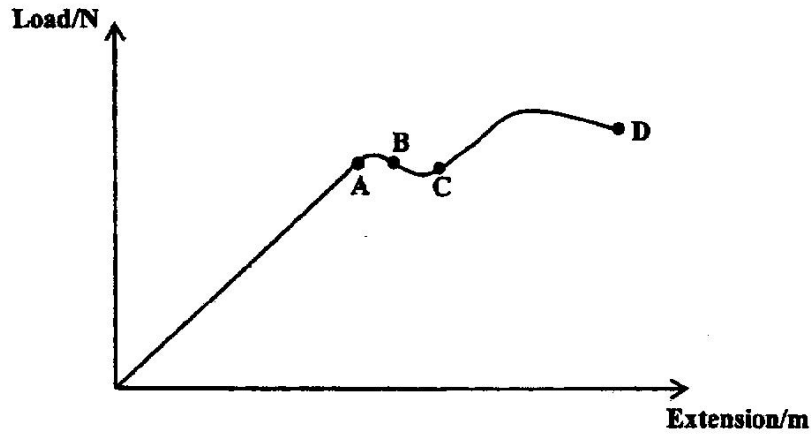
   _____

   _____

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   _____

   [3 marks]

3. List **three** types of artificial satellites.

   _____

   _____

   _____

   [3 marks]

4.

The diagram above is a graph of load against extension for a wire under varying tension. Identify the:

(a)   segment in which Hooke's law is obeyed;

_____

(b)   segment where elasticity holds;

_____

(c)   yield point.

_____ [3 marks]

5.   *(a)*   Why are optical fibres wrapped in bundles?

_____

_____

_____

_____

_____

(b)   By what optical phenomenon does an optical fibre transmit light along its axis?
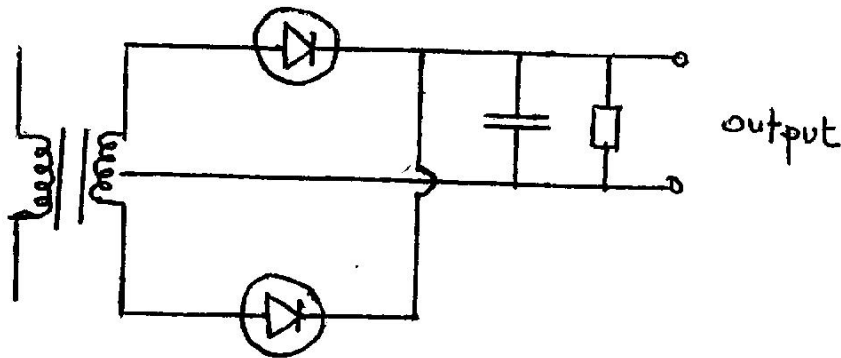
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_____

_____

_____ [3 marks]

6. *(a)* Distinguish between *metals* and *semiconductors* in terms of their energy bands.

_____

_____

_____

(b) State the effect of increasing temperature on the electrical resistance of semiconductors.

_____

_____

_____

[3 marks]

7.

Draw the output waveform for the circuit diagram illustrated above.

[3 marks]

PART II

[45 marks]

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

All *questions carry* **equal** *marks.*

8.   *(a)*   A jet plane starts from rest with an acceleration of 3 $m\,s^{-2}$ and makes a run for 30 s before taking off. Calculate the:

        (i)   distance travelled before take-off;

_____

_____

_____

_____

_____

        (ii) velocity of the plane at take off.

_____

_____

_____

_____

_____

[5 marks]

   (b)   (i)   Differentiate between *elastic collision* and *inelastic collision*.

_____

_____

_____

_____

(ii) Two bodies of masses 6 kg and 4 kg moving in opposite directions with velocities of 9 $m\ s^{-1}$ and 7 $m\ s^{-1}$ respectively, collide and move together. Calculate their common velocity.

_____

_____

_____

_____

_____

[5 marks]

(c)   State:

(i) the *Pascal's principle*;

_____

_____

_____

_____

(ii) **two** applications of the Pascal's principle;

_____

_____

_____

_____

(iii) the condition for a body to float in a liquid.

_____

_____

_____

_____

[5 marks]

9. (a) Define **each** of the following terms:

(i) *humidity*;

_____

_____

_____

_____

(ii) *saturated vapour*.

_____

_____

_____

_____

[4 marks]

(b) Explain **each** of the following observations:

(i) steam at $100^{\circ} C$ causes more severe burns than water at $100\,^{\circ}C$;

_____

_____

_____

_____

(ii) water pipes sometimes burst during very cold weather.

_____

_____

_____

_____

[4 marks]

(c) State **two** differences between *heat* and *temperature*.

_____

_____

_____

_____

_____

[2 marks]

(d) A simple pendulum has a period of 4.2 *s*. When its length is shortened by 1 *m*, the period becomes 3.7 *s*. Calculate the:

(i) original length of the pendulum;

_____

_____

_____

_____

_____

_____

(ii) acceleration due to gravity.
[Take $\pi = 3.142$]

_____

_____

_____

_____

_____

_____

[5 marks]

10. *(a)* (i) State **two** differences between *the lens of the human eye* and *the lens of the camera.*

_____

_____

_____

_____

_____

(ii) What is meant by *accommodation of the eye?*

_____

_____

_____

[4 marks]

(b) Explain **each** of the following terms as applied in sounds:

(i) *overtones;*

_____

_____

_____

(ii) *resonance.*

_____

_____

_____

(iii) *fundamental note.*

_____

_____

_____

[6 marks]

(c) Define the *principal focus* of a diverging lens.

_____

_____

_____

[2 marks]

(d) A diverging lens of focal length 10 *cm* forms an image 5 *cm* high at a distance of 8 *cm* from the lens. Calculate the:

(i) object distance;

_____

_____

_____

_____

_____

_____

_____

(ii) image height.

_____

_____

_____

_____

_____

_____

[3 marks]

11. *(a)* (i) Define *capacitance* of a capacitor.

_____

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_____

(ii) What is the reason for putting a dielectric between the plates of a capacitor?

_____

_____

_____

(iii) State **two** applications of capacitors.

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(iv) The potential difference between the plates of a capacitor is 135 V and the plate separation is 1.5 *cm*. If a 4.5×10^{-15} *kg* charged oil drop between the plates is stationary, calculate the magnitude of the charge on the oil drop.

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[8 marks]

(b) Define *electric field intensity* at a point.

_____

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_____

[2 marks]

(c) Two point charges of magnitudes $+5.0 \times 10^{-5}\, C$ and $+3.0 \times 10^{-5}\, C$ situated in a vacuum, are separated by a distance of 2.0 *cm* . Determine the:

   (i) electric field intensity at a point , P, midway between the charges;

_____

_____

_____

_____

_____

_____

   (ii) force on a $+2.0 \times 10^{-6}\, C$ charged body at P.

$$[\; \frac{1}{4\pi\varepsilon_0} \;=\; 9.0 \times 10^9\, N\,m^2\,C^{-2}]$$

_____

_____

_____

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[5 marks]

12. *(a)* (i)   Define *natural radioactivity.*

_____

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_____

_____

(ii)   State the relationship between the decay constant λ, and the half life, $t_{\frac{1}{2}}$, of a radioactive decay process.

_____

_____

_____

_____

(iii)   A radioactive element has a decay constant of 4.6×10^{-2} atoms per minute. The initial reading on a detector for radiations of this element is 1600 per minute. Calculate the time taken for the rate to fall to 100 per minute.

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_____

[8 marks]

(b) (i)   What are *cathode rays*?

_____

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_____

_____

(ii) State **four** properties of cathode rays.

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[4 marks]

(c) (i) State the energy transformations which take place during the operation of X-ray tube.

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(ii)   State **two** uses of X-rays.

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[3 marks]