Physics (Essay) Paper 2 WASSCE (PC), 2022

Question 1

A missile is projected so as to attain its maximum range. Calculate the maximum height attained if the initial velocity of projection is 200m s-1. [g = 10*m* s-2]

Observation

The expected response:

Maximum height attained by the projectile

At maximum range, $\theta = 45°$

From $H = \frac{u^2 Sin^2\theta}{2g}$

$= \frac{200^2 (Sin\ 45)^2}{2 \times 10}$

$= 1000$ m.

Physics (Essay) Paper 2 WASSCE (PC), 2022

Question 2

(a) What does the acronym *LASER* stand for?
(b) State **two** areas of application of *LASERS*.

Observation

The expected response:

(a) **LASER**
Light Amplification by Stimulated Emission of Radiation.
(b) **Areas of application of LASERS**

- medicine - communication
- entertainment - electronics
- industry - warfare

e-Learning

- Index
- Language ▾
- General ▾
- Business ▾
- Science ▾
- Mathematics And Applied Science ▾
- Home Economics ▾
- Civil And Mechanical ▾

Physics (Essay) Paper 2 WASSCE (PC), 2022

- Subject Home
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12

Menu

General Comments

Weakness/Remedies

Candidate's Strength

Question 3

(a) State **one** difference *intrinsic* and *extrinsic* semiconductors.
(b) Draw and label **suitable** diagrams to distinguish between *an insulator* and a semiconductor.

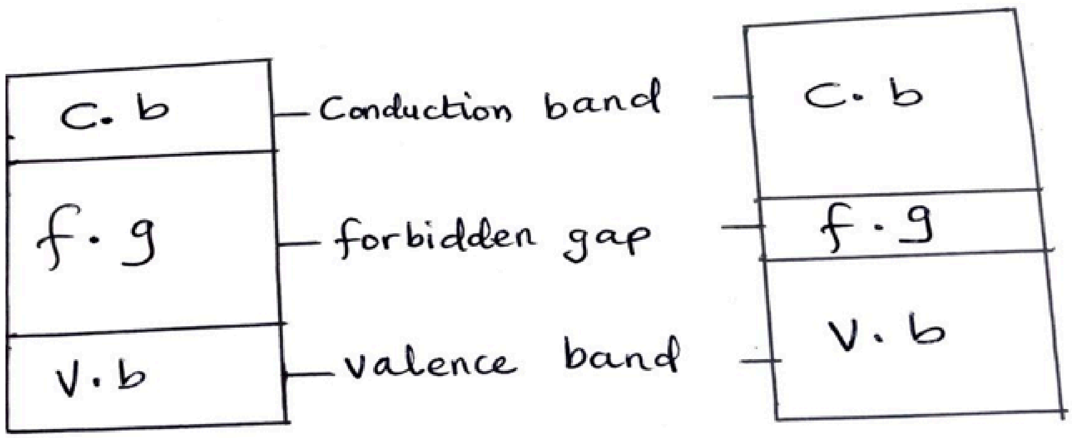
Observation

The expected response:
(a) **Difference between Intrinsic and Extrinsic Semiconductors**

Intrinsic	Extrinsic
Equal number of charge carriers/pure/undoped	Unequal number of charge carriers/impure/doped
Lower electrical conductivity	Higher electrical conductivity

(b) **Difference between an insulator and a semiconductor**

Insulator **Semiconductor**



Prev Next

Physics (Essay) Paper 2 WASSCE (PC), 2022

Question 4

(a) Define the term parking orbit
(b) State **one** use of a communication satellite.

Observation

The expected response;
(a) **Definition of Parking Orbit**
The path around a planet/earth in which a satellite's period of revolution becomes equal to the period of rotation of the planet/earth.

OR

A path along which a satellite moves round the earth such that its period of revolution equals 24 hours/ 1
day.

(b) **Uses of Communication Satellite**
- Transmission of information/signals/data (from one part of the globe to another).
- Weather tracking/forecasting

Prev Next

e-Learning

- Index
- Language ▼
- General ▼
- Business ▼
- Science ▼
- Mathematics And Applied Science ▼
- Home Economics ▼
- Civil And Mechanical ▼

Physics (Essay) Paper 2 WASSCE (PC), 2022

- Subject Home
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12

Menu

General Comments

Weakness/Remedies

Candidate's Strength

Question 5

A piece of wire 25 cm long is stretched by the application of a load until its length is increased by 1.2 mm. calculate the energy stored in the wire.
[Spring constant k = 1.0 x 105 *N m*-1]

Observation

The expected response:

Energy stored in the wire

$$E = \frac{1}{2}ke^2$$

$$= \frac{1}{2} \times 1.0 \times 10^5 \times (1.2 \times 10^{-3})^2$$

$$= 7.2 \times 10^{-2}\ J$$

Prev Next

Physics (Essay) Paper 2 WASSCE (PC), 2022

Question 6

The quality, P, is expressed by the equation

$$P = \frac{1}{2}\frac{qt}{x}$$

Where P represents momentum, t represents time and ***x*** represents distance

(a) Determine the dimension of the quantity, *q*.

(b) What quantity does *q* represent?

Observation

Few candidatesattempted this question and got the correct response. Performance was below average.

The expected response

i. A p-n junction

Boundary/interface between a p-type and an n-type semiconductors joined together.

ii. Differentiating between the production of p-type semiconductor and n-type semiconductor

P-type semiconductor is produced by doping a pure semiconductor with trivalent atoms while n-type semiconductor is produced by doping a pure semiconductor with pentavalent atom.

Prev Next

e-Learning

Physics (Essay) Paper 2 WASSCE (PC), 2022

Question 7

(a) What is *a perfect blackbody*?
(b) Give **one** practical example of a blackbody.

Observation

The expected response:
(a) **Definition of a perfect blackbody**
A body that absorbs all incident radiations falling on it without reflecting or transmitting any.
OR
A body that absorbs completely radiations of all wavelengths falling on it.

(b) **Practical examples of a blackbody**
- A tiny deep hole (inside a cavity)
- The sun
- The earth.

e-Learning 

Physics (Essay) Paper 2 WASSCE (PC), 2022

Menu

General Comments

Weakness/Remedies

Candidate's Strength

Question 8

(a) (i) what are *crystalline substances*?
(ii) state **two** examples **each** of:
(α) crystalline substance;
(β) amorphous substance.

(b) (i) A body was placed at different points on the earth's surface and was observed that its weight varies at different points. State **three** reasons for the observation
(ii) A car travels from a starting point, P, and moves *x* km northwards, 40 *km* eastwards, 30 *km* southwards and then gets to a point m where it turns 400 west of south at a distance of 50 *km* from its starting point, P.
(α) Sketch a diagram showing the directions of motion of the car at **each** stage.
(β) Calculate the value of *x*
(c) State **three** characteristics of pressure in fluids.

Observation

The expected response:
(a) (i) **<u>Crystalline substances</u>**
They are substances whose ions/atoms/molecules are arranged in a regularly repeated pattern. [2 marks]
(ii) (α) **<u>Examples of crystalline substances</u>**
- Sodium chloride/common salt/table salt
- Zinc chloride
- Copper sulphate
- Ice
- Zinc sulphate

- Sodium sulphate
- Diamond
- Graphite
- Sodium sulphate
- Sodium nitrate

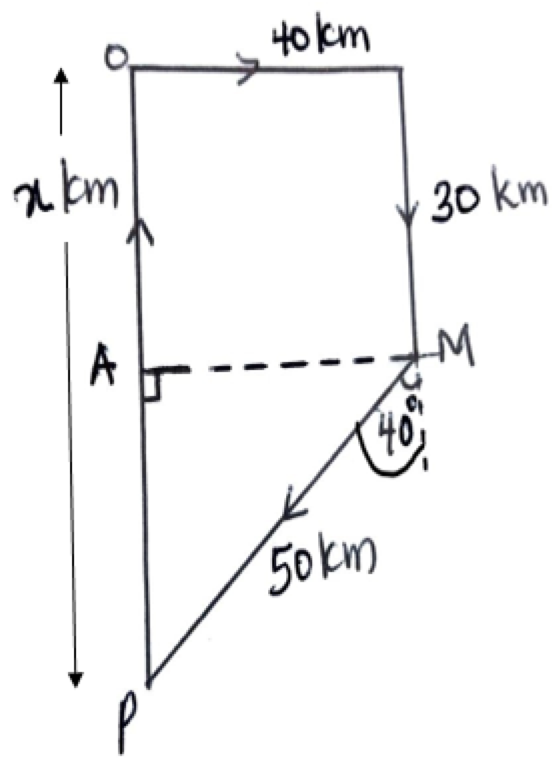
(β) **Examples of Amorphous substances**

- Glass
- Wood
- Paper
- Asbestos
- Plastic
- Rubber
- Coal

(b) (i) **Reasons for observation**

- Rotation of the Earth
- Shape of the Earth/The Earth is not a perfect sphere
- Variation in acceleration due to gravity

(ii) (α) **Sketch of motion of the car**



(β) $x = |AO| + |AP| = 30\ km + |AP|$

$|AP| = 40$ km

By Pythagoras rule

$|PM|^2 = |AP|^2 + |PA|^2$

$50^2 = 40^2 + |PA|^2$

$|PA|^2 = 50^2 - 40^2 = 900$

$|PA| = 30\ km$

$\therefore x = 30$ km + 30 km

= 60 km

OR

$AP = 50\ Sin50 = 50\ Cos\ 40$

$= 38.33\ km$

$x = AP + 30$

$= 38.3 + 30$

$= 68.3\ km$

OR

$AP = 40\ tan50$

$= 47.7\ km$

$x = AP + 30$

$= 47.7 + 30$

$= 77.7\ km$

(c) **<u>Characteristics of Pressure in Fluids</u>**

- It is independent of the area of the containing vessel.
- It increases with depth.
- It depends on the density of fluid.
- It is equal at all points at the same level.
- It is transmitted equally in all directions at a given level.
- It is dependent on acceleration due to gravity.

Prev Next

e-Learning

- Index
- Language ▼
- General ▼
- Business ▼
- Science ▼
- Mathematics And Applied Science ▼
- Home Economics ▼
- Civil And Mechanical ▼

Physics (Essay) Paper 2 WASSCE (PC), 2022

- Subject Home
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12

Menu

General Comments

Weakness/Remedies

Candidate's Strength

Question 9

(a) (i) The *s.v.p.* of water vapour on acertain day at air temperature 28 0C is 12.2 *mmHg*. Calculate the relative humidity of a day when the *s.v.p.* of water vapour at dew point is 15.9 *mmHg*.

(ii) State **two** effects of expansion of water when it freezes to ice.

(b) A quantity of liquid of mass 600 g placed in a plastic container with a tight fitting lid has a temperature of 30 0C. The container is placed in a microwave oven rated 1250 *W*.

(i) if the microwave is operated for 4 *minutes*, calculate the **final** temperature attained by the liquid. (*assuming no heat losses* [Specific heat capacity of the liquid = 4100 *j kg-1 K-1*]

(ii) If the liquid is brought out and allowed to cool, a dent is observed on the container. Explain.

(c) Explain why containers with tight-fitting lids are **not** suitable for use in microwave cooking.

(d) (i) Define *fixed points* on a temperature scale.

(ii) State **one** effect of heat on a substance.

Observation

The expected response:

(a) (i) **Calculation of relative humidity**

$$\text{Relative humidity} = \frac{S.V.P\ at\ dew\ point}{S.V.P\ at\ air\ temperature} \times 100\ \%$$

$$= \frac{15.9}{12.2} \times 100\ \%$$

$$= 130\ \%$$

(ii) **Effects of expansion of water when it freezes to ice**

- Decrease in density
- Increase in volume/ cracks on the containing vessel.

(b) (i) **Final temperature attained by the liquid**

$Pt = mc\Delta\theta$	$Pt = mc\Delta\theta$
$1250 \times 4 \times 60 = \frac{600}{1000} \times 4100 \times \Delta\theta$	$1250 \times 40 \times 60 = 0.6 \times 4100\ (\theta - 30)$
Final temperature $= 122\ °C + 30°\ C$ $= 152\ °C$	$\theta = 152\ °C$

(ii) The container is dented because the condensation of the steam will lead to a decrease in pressure making the atmospheric/external pressure greater than the pressure in the container.

(c) **Explanation of observation**

- The molecules of the steam are confined. As the temperature increases, the rate of
- collision of the molecules with walls of the container increases, the pressure
- inside the container increases, causing it to burst.

(d) (i) **Fixed point on a temperature scale**

Accurate and standard temperatures used as reference point on the temperature scale.

(ii) **Effects of heat on a substance**:

- Change:
- in temperature
- in (electrical) resistance
- of state
- in colour
- in dimension

Prev Next

e-Learning

Physics (Essay) Paper 2 WASSCE (PC), 2022

Question 10

(a) State **two** conditions necessary for diffraction of waves to occur.
(b) Explain **each** of the following terms as used in connection with waves
(i) *wavefront*;
(ii) *wavelength*;
(iii) *antinode*.

(c) Two plane progressive waves, $y1 = 0.2 \sin (200)$ and $y2 = 0.3 \sin (200) \sin$ where *y* and *x are both in cm* and *t* in *s*, undergo superposition. Sketch the

(i) displacement-time graph graph of y1for **one** complete cycle;
(ii) resultant wave, Y, for the superposition of y1 and*y*2.
(d) Draw a ray diagram illustrating the operation of a simple microscope.

Observation

The expected response:
(a) **Conditions necessary for diffraction of waves to occur**
- Waves must encounter an obstacle/aperture
- Aperture size must be of the order of the wavelength
- Source of wave must be monochromatic
- Wave must be progressive/travelling.
-
- (b) **Explanation of terms**
- (i) Wavefront : Imaginary section/plane/line through the wave, the surface of which the particles vibrate in phase .

(ii) Wavelength: The distance covered/travelled by the wave in one complete cycle.

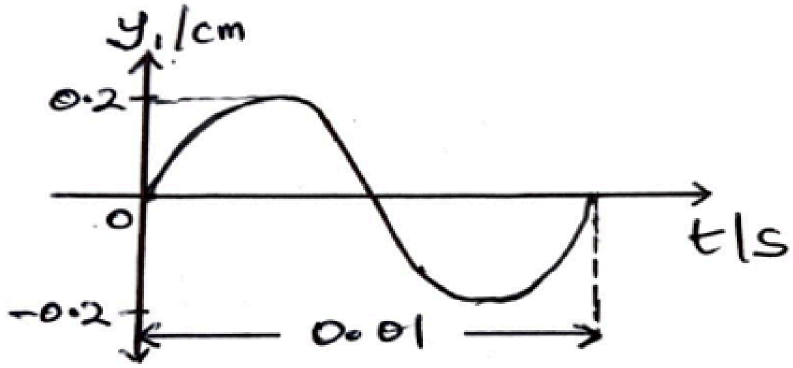
OR

The distance between szccessive crest or troughs

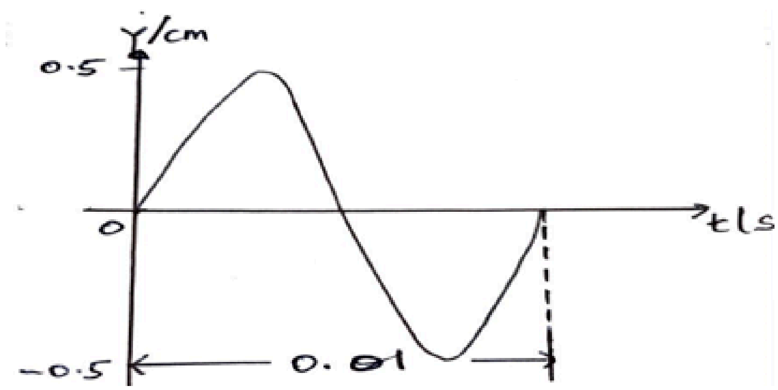
It is measured in metres.

(iii) Antinode: The point along a stationary waveprofile where the displacement of the particle is at its maximum.

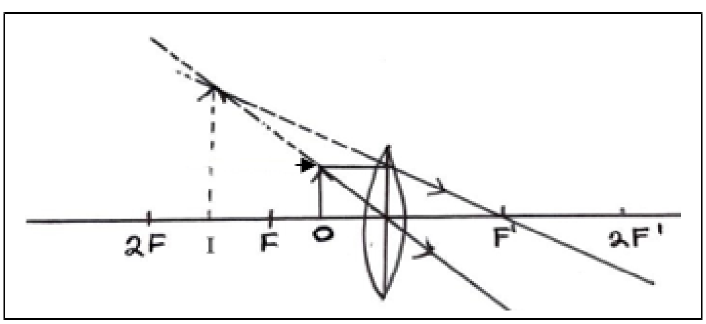
(c) (i) **Displacement-time graph of y_1 for one complete cycle.**



(ii) **Resultant wave , Y**



(d) **Ray diagram illustrating the operation of a simple microscope.**



Prev Next

e-Learning

Physics (Essay) Paper 2 WASSCE (PC), 2022

Question 11

(a) State **two** uses of electromagnets.
(b) A resistance wire has a length of 1.5 *m* and cross-sectional area of 7.85 x 10-7*m*2. If the wire is connected across the left gap of a metre bridge and a 5 Ω resistor across the right gap, a balance point of 60.0 *cm* from the left side of the bridge wire is obtained. Calculate the resistivity of the wire.
(c) The plates of a parallel plate capacitor **each** of are 2.0 *m*2 are 5.0 x 10-3*m* apart in air. If the *p.d.* across the plates is 10 *kV*, calculate the:
(i) capacitance of the capacitor;
(ii) charge on **each** plate;
(iii) electric field intensity across the places.

$[\varepsilon_0 = 8.85 \times 10^{-12} F\, m\text{-}1]$

(d) (i) Define *electrical potential* at a point in an electric field.
(ii) State the relationship between *electric potential*, V and *electric field intensity*,E.

Observation

The expected response:

(a) (i) **Uses of electromagnets**

Used in:

- electric bell.
- telephone earpiece.
- lifting heavy objects(metallic) in industry.
- separating metals from non-metals.

- transformers.
- relays.
- buzzers.
- loud speakers.

(b) (i) **Resistivity of the wire**

Resistance , Rw, of the wire is given by $\frac{R_W}{l_1} = \frac{R_S}{(100 - l_1)}$

$$\frac{R_W}{60} = \frac{5}{40}$$

$$R_W = \frac{60 \times 5}{40}$$
$$= 7.5\ \Omega$$

$$\rho_w = \frac{R_W A_W}{L_W}$$

$$\rho_w = \frac{7.5 \times 7.85 \times 10^{-7}}{1.5}$$
$$= 3.925 \times 10^{-6}\ \Omega\,\text{m}$$

(c) (i) **Capacitance of the capacitor**

$$Capacitance, C = \frac{\varepsilon_0 A}{d}$$
$$= \frac{8.85 \times 10^{-12} \times 2.0}{5.0 \times 10^{-3}}$$
$$= 3.54 \times 10^{-9}\text{F}$$

(ii) **Charge on each plate**

$$Q = CV$$
$$= 3.54 \times 10^{-9} \times 10^{4}$$
$$= 3.54 \times 10^{-5}\ C$$

(iii) **Electric field intensity across the plates**

$$E = \frac{V}{d}$$
$$= \frac{10 \times 10^{3}}{5.0 \times 10^{-3}}$$

(d) (i) **Definition of electric potential at a point in an electric field.**

The work done in bringing a unit positive charge from infinity to the point in an electric field.

(ii) **Relationship between electric potential, V, and electric field intensity, E**

$$E = \frac{V}{r}$$

Prev Next

e-Learning

- Index
- Language ▼
- General ▼
- Business ▼
- Science ▼
- Mathematics And Applied Science ▼
- Home Economics ▼
- Civil And Mechanical ▼

Physics (Essay) Paper 2 WASSCE (PC), 2022

- Subject Home
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12

Menu

General Comments

Weakness/Remedies

Candidate's Strength

Question 12

(a) Define **each** of the following terms as applied to the structure of the atom:
(i) isotopes;
(ii) isobars.
(b) A lead sphere of mass 5.0 x 10-3*kg* is allowed to fall to the ground from a height of 20.0 *m*. Determine the:

(i) speed of the sphere just before it hits the ground;

(ii) *deBroglie* wavelength of the sphere just before it hits the ground.[g = 10.0 *m s*-2; *h* = 6.63 x 10-34*J s*]

(c) An electron is accelerated in an X-ray tube with a supply of 100 *kV* accelerating potential. Calculate the:

(i) speed of the electron;

(ii) wavelength of the x-ray that will be produced when the electron is suddenly Stopped by a solid metal placed on its path.[*h* = 6.63 x 10-34*J s*, e = 1.6 x 10-19 *C*, Me = 9.1 x 10-31 *kg*]

Observation

The expected response:
- (a) **Definition of terms**
- (i) Isotopes : Atoms of the same element with the same proton/atomic number but different neutron/mass number.

(ii) Isobars : Atoms of different elements with the same nucleon/mass number but different proton/atomic number.

(b) (i) **Speed of sphere just before it hits the ground**

$$\frac{1}{2} mv^2 = mgh$$

OR

$$v = \sqrt{2gh}$$

$$= \sqrt{2 \times 10 \times 20}$$

$$= 20 \text{ m s}^{-1}$$

(ii) **de Broglie wavelength of the sphere just before it hits the ground**

$$\lambda = \frac{h}{mv}$$

$$\lambda = \frac{6.63 \times 10^{-34}}{5 \times 10^{-3} \times 20}$$

$$= 6.63 \times 10^{-33} \text{ m}$$

(c) (i) **Speed of electron**

$$\frac{1}{2} mv^2 = eV$$

$$v^2 = \frac{2 \times 1.6 \times 10^{-19} \times 100 \times 10^3}{9.1 \times 10^{-31}}$$

$$v = \sqrt{3.52 \times 10^{16}}$$

$$= 1.88 \times 10^8 \text{ m s}^{-1}$$

(ii) **Wavelength of the X-ray**

$$\lambda = \frac{h}{mv}$$

$$\lambda = \frac{6.63 \times 10^{-34}}{9.1 \times 10^{-31} \times 1.88 \times 10^8}$$

$$= 3.88 \times 10^{-12} \text{ m.}$$

Prev