CAMEROON GENERAL CERTIFICATE OF EDUCATION BOARD
General Certificate of Education Examination

JUNE 2020 **ORDINARY LEVEL**

Subject Title	**Physics**
Paper No.	**2**
Subject Code No.	**0580**

Two and a half hours

Answer ALL questions.

Section I is designed to be answered in 1 hour and Section 2 in 1½ hours.

You are advised to divide your time accordingly.

In section II answer EITHER the a, b and c OR the d, e, and f of each question

For your guidance the approximate mark for each part of a question is indicated in brackets.

You are reminded of the necessity for good English and orderly presentation in your answers.

In calculations you are advised to show all the steps in your working, giving your answer at each stage.

Where necessary, assume:
- *the acceleration of free fall, $g = 10\ m\ s^{-2}$*
- *the speed of light in air, $c = 3 \times 10^8\ m\ s^{-1}$*
- *the charge on an electron, $e = 1.6 \times 10^{-19}\ C$*

Calculators are allowed.

SECTION I

Answer all questions in one hour.

1. (a) Define
   (i) Energy
   (ii) Power
   (2 marks)

   (b) A waterfall is 80 m high. If at a certain instant, 220 kg of water fall to the bottom of the waterfall:
   (i) Calculate the potential energy of this mass of water at the top of the water fall. **(2 marks)**
   (ii) Explain why the water at the bottom of the waterfall is warmer than that at the top. **(1 mark)**
   (iii) Name any machine used at a building site and state its use. **(2 marks)**

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2. A simple weighing machine was constructed from a uniform metal bar of length 1.5 m and of mass 7.0 kg. It was pivoted at 0.4 m from one end, as shown in Figure 1. A bag of cocoa of mass 80 kg was placed at P.

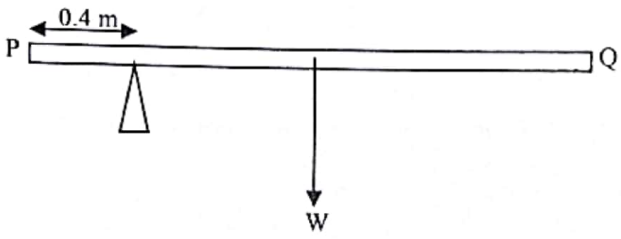

Figure 1

   (a) Calculate:
   (i) The weight of the bag of cocoa. **(2 marks)**
   (ii) The moment of the bag of cocoa about the pivot. **(2 marks)**
   (iii) The moment of the metal bar about the pivot. **(1 mark)**
   (iv) The mass that must be placed at Q in order to balance the metal bar. **(2 marks)**

   (b) Give one everyday situation in which a
   (i) couple is used
   (ii) moment is used.
   (2 marks)

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3. Figure 2 shows a bar magnet, N-S, held near a coil wound around a cardboard tube, and which is connected to a galvanometer, G.

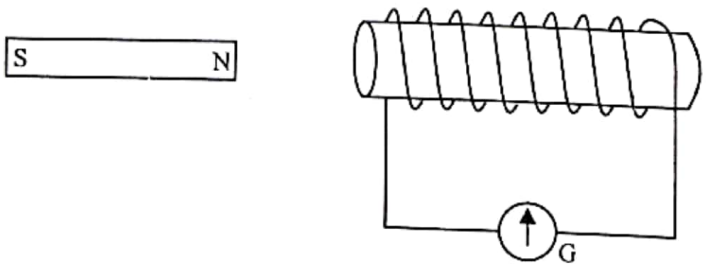

Figure 2

   (a) Copy the diagram and draw the magnetic flux pattern for the bar magnet. **(2 marks)**
   (b) State what will be observed on the galvanometer if the magnet is moved rapidly towards the coil. **(1 mark)**
   (c) Draw the magnetic flux pattern for the coil as the magnet approaches it. **(2 marks)**

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4. Figure 3 shows how resistors may be connected to a power source with two switches, S_1 and S_2.

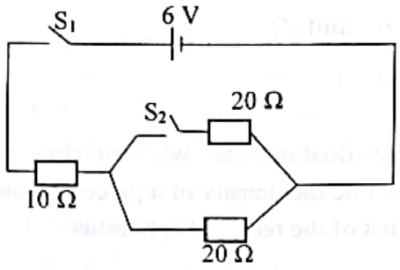

Figure 3

(a) Name two types of circuit connections. **(2 marks)**

(b) Explain how you can use the two switches to get each of the circuit connections named in (a) above. **(2 marks)**

(c) Calculate the resistance for each of the circuit types. **(2 marks)**

(d) State the circuit type which is more commonly used in house wiring and justify the choice with a reason. **(2 marks)**

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5. Explain the following:

(a) On a hot afternoon, it is cooler inside a house with a thatched roof than in the neighbouring house roofed with aluminium. **(2 marks)**

(b) When two blocks of ice are pressed against each other, they stick together after they are released. **(2 marks)**

(c) Steam, rather than boiling water, is used for determining the upper fixed point of a thermometer. **(1 marks)**

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6. (a) Name the possible radiations that could be emitted by radioactive nuclei. **(3 marks)**

(b) A particular radioactive nuclide has a half-life of 24 days. If 6.4×10^8 atoms of this nuclide are initially isolated and stored in an enclosure, determine the number of nuclei that would have decayed after 96 days. **(3 marks)**

Section 2 (1 ½ hours)

Answer ALL questions, choosing one question from each pair of alternatives

Answer either 7 (a), (b) and (c) OR 7 (d), (e) and (f)

EITHER 7 (a), (b) and (c)

7. (a) (i) State two reasons why some solids float in water, while others sink in water. **(2 marks)**

(ii) Describe an experiment to determine the density of a piece of iron. Your account should include:

- an experimental setup or a list of the required apparatus
- the procedure to follow
- the measurements to be made
- how to obtain a conclusion from the measurements
- any precaution taken **(6 marks)**

(iii) Name one use of a solid with:

- a high density
- a low density. **(2 marks)**

(b) Figure 4 shows a bob suspended on a rubber band such that the system is stable.

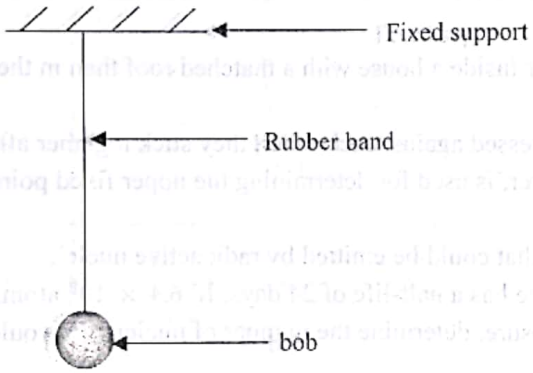

Figure 4

(i) Copy the diagram and show two forces acting on the system. **(2 marks)**

(ii) Name the forms of energy possessed by the rubber band and the bob. **(2 marks)**

(iii) Do all elastic materials obey Hooke's law? Justify with examples. **(2 marks)**

(c) Figure 5 shows the velocity-time graph of a car which starts from rest and moves for 20 seconds.

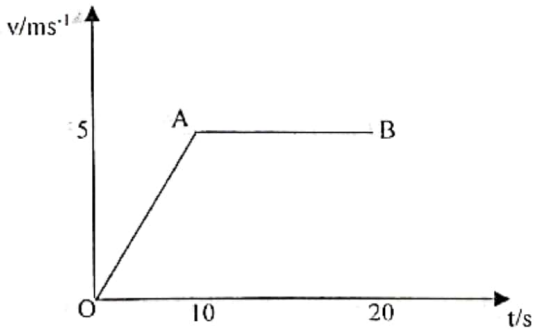

Figure 5

(i) Describe the motion of the car in section OA and section AB of the graph. **(2 marks)**

(ii) Calculate the distance covered by the car from rest for the 20 seconds. **(2 marks)**

OR 7 (d), (e) and (f)

7. (d) (i) State two ways by which waves are classified. **(2 marks)**

(ii) Describe an experiment to show that light does not need a material medium for propagation, but that sound needs a material medium for propagation. Your description should include:

- an experimental setup or a list of required apparatus
- the procedure to follow
- the measurements or observations made
- how to obtain a conclusion from the observations
- any precaution taken. **(6 marks)**

(iii) State one practical situation each in which a wave is used because it either needs a material medium to travel or it does not need a material medium to travel. **(2 marks)**

(e) Figure 6 shows a convex lens, L, of focal length, 5 cm with an object, O, placed perpendicularly to its principal axis.

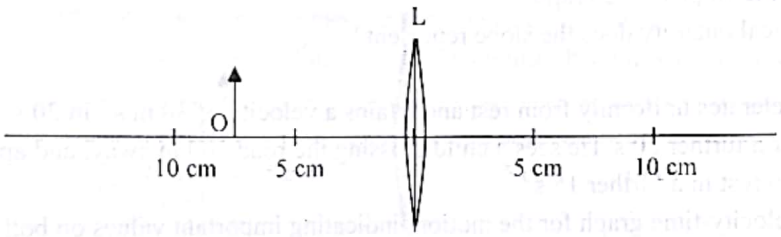

Figure 6

(i) Copy the diagram and use any two rays of light from the object to indicate how the lens forms an image of the object. **(3 marks)**

(ii) Give any two characteristics of the image formed. **(2 marks)**

(iii) Name a practical device in which a lens is used to form an image of an object as in Figure 6. **(1 mark)**

(f) Figure 7 shows a thin metal wire, AB, which is tied at the points A and B such that it is stiff.

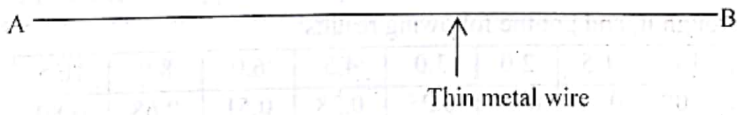

Figure 7

(i) Name the energy changes which take place if the wire is plucked with the finger or a small piece of broom. **(2 marks)**

(ii) Sketch a diagram to show the appearance of the plucked wire, and indicate the distance that represents one wavelength. **(2 marks)**

Answer either 8 (a) and (b) and (c) OR 8 (d), (e) and (f)

EITHER 8 (a), (b) and (c)

8. (a) Define
   (i) Electrostatic force. **(2 marks)**
   (ii) Friction. **(2 marks)**

   (b) A student was investigating the acceleration of a small toy car down a run way using different forces. The data collected was as shown in the table below.

F/N	0.0	2.0	4.0	6.0	8.0	12.0	16.0	18.0	20.0
a/m s^{-2}	0.0	1.6	3.4	5.2	7.0	10.6	14.2	16.0	18.0

   (i) Define acceleration. **(2 marks)**
   (ii) Plot a graph of F/N (y-axis) against a/m s^{-2} (x-axis). **(5 marks)**
   (ii) Determine the slope of the graph. **(2 marks)**
   (iv) What physical quantity does the slope represent? **(1 mark)**

   (c) A motorist accelerates uniformly from rest and attains a velocity of 30 m s^{-1} in 20 s. He then continues with this velocity for a further 20 s. He sees a child crossing the road 500 m away, and applies the brakes. This brings the car to rest in a further 15 s
   (i) Sketch a velocity-time graph for the motion, indicating important values on both axes. **(3 marks)**
   (ii) Show by calculation whether or not the motorist hits the child. **(3 marks)**

OR 8 (d), (e) and (f)

8. (d) (i) State Ohm's law. **(2 marks)**
   (ii) Define resistance and state its SI units. **(2 marks)**

   (e) A student wanted to investigate Ohm's law using a piece of copper wire. She measured the p.d. across the wire, and the current through it, and got the following results:

p.d./V	0.0	1.0	1.5	2.0	3.0	4.5	6.0	8.0	10.5
I /A	0.0	0.08	0.13	0.17	0.25	0.38	0.51	0.68	0.89

   (i) Name the instrument used to measure the current and say how it is connected to the copper wire. **(2 marks)**
   (ii) Plot a graph of p.d. (y-axis) against I (x-axis). **(5 marks)**
   (iii) Determine the slope of your graph. **(2 marks)**
   (iv) What physical quantity does the slope represent? **(1 mark)**

   (f) An earth wire is considered as a safety precaution in house wiring.
   (i) What does it protect? **(1 mark)**
   (ii) Explain how the protection in (i) above is ensured. **(2 marks)**
   (iii) A coffee maker is rated 2200 W, 240 V. A student brought a 5 A fuse to use on the coffee maker. Calculate the maximum current that flows in the coffee maker, and hence determine whether or not the 5 A fuse is suitable for use in the appliance. **(3 marks)**

Answer either 9 (a), (b) and (c) OR 9 (d), (e) and (f)

EITHER 9 (a), (b) and (c)

9. (a) Define the following and state their S.I. units of measurement.
   (i) Heat. **(2 marks)**
   (ii) Temperature. **(2 marks)**
   (iii) State two features on a clinical thermometer that makes it different from a normal liquid – in –glass thermometer. **(2 marks)**

   (b) (i) Distinguish between heat capacity and specific heat capacity. **(2 marks)**
   (ii) 500 g of water were heated using an electric heater rated 1000 W for 2 minutes. If the specific heat capacity of water is $4200\ J\ kg^{-1}\ K^{-1}$. Calculate the temperature change **(4 marks)**
   (iii) State one use of water due to its high specific heat capacity. **(1 marks)**

   (c) (i) Define thermal expansion. **(2 marks)**
   (ii) Explain how a bimetallic strip works in an electric iron to switch it on and off. **(3 marks)**
   (iii) Explain why a metal spoon, left beside a flame for a few minutes becomes so hot to touch. **(2 marks)**

OR 9 (d), (e) and (f)

9. (d) Define the following:
   (i) Radioactivity. **(2 marks)**
   (ii) Half -life. **(2 marks)**
   (iii) State two differences between n-type and p-type semiconductors. **(2 marks)**

   (e) (i) Distinguish between fusion and fission. **(2 marks)**
   In a radioactive fission reaction, a nuclide $^{238}_{92}X$ undergoes two α-decays and two β-decays to form a daughter nuclide
   (ii) Write a balanced equation for this reaction. **(4 marks)**
   (iii) State one use of a named radioisotope. **(1 mark)**

   (f) (i) Define background radiation. **(2 marks)**
   (ii) State and explain the nature of tracks produced by alpha particles in a cloud chamber. **(3 marks)**
   (iii) State two safety precautions to take in handling radioactive materials. **(2 marks)**