KCSE PHYSICS 2017
PAPER 1

SECTION A: (25 marks)

Answer all the questions in this section in the spaces provided.

1. In order to determine the size of an oil molecule, a student performed an experiment using five oil drops to make a circular patch of the oil on the surface of water in a waterbath. State two assumptions made by the student during the calculations. (2 marks)

2. In an experiment to determine the density of Liquid R, a student obtained the followed data:
   - Mass of an empty density bottle = 55.0 g
   - Mass of the density bottle + water = 80.0 g
   - Mass of the density bottle + Liquid R = 70.0 g

   Determine the density of Liquid R. *(density of water is 1000 kgm^{-3}}* (3 marks)

3. It is observed that when 20 cm^3 of alcohol is mixed with 20 cm^3 of water, the volume of the mixture is 39cm^3. State a reason why the volume of the mixture is not 40cm^3. (1 mark)

4. When a liquid is heated in a glass flask, it is observed that the level at first goes down and then rises. Explain this observation. (2 marks)

5. **Figure 1** shows a uniform wooden bar at equilibrium with two cans Y and **Z**of equal mass but different diameters.

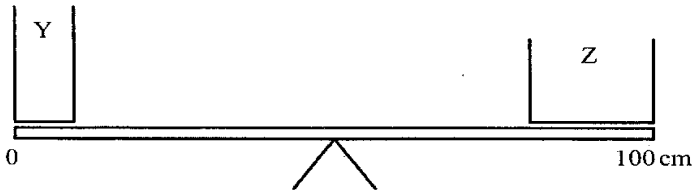

Figure 1

The cans are simultaneously filled with equal volumes of water.
Explain the observation made.(2 marks)

6. State the reason why the speed of water at the narrow section of a river is higher than at the wider section. (1 mark)

7. A stone is thrown vertically upwards. Sketch a graph of potential energy *(y* axis) against **time** as the stone moves until it hits the ground. (1 mark)

8. Using the definition of impulsive force, show that F= ma(3 marks)

9. **Figure** 2 shows a round bottomed flask fitted with a long capillary tube containing a drop of coloured water.

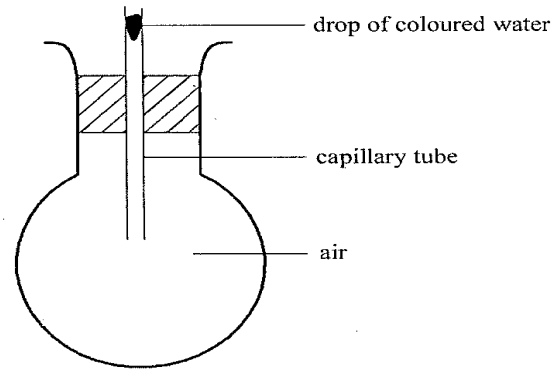

Figure 2

The flask is immersed in ice water for sometime. State the observation made. (2 marks)

10. State one assumption for the experiments carried out to verity the gas laws. (1 mark)

11. A student who wanted to take a bath mixed 4 kg of water at 80 °C with 6 kg of water at 20 °C. Determine the final temperature of the water. (3 marks)

12. A uniform metre rule is pivoted at its centre. Two weights of 20N and 10N are suspended at the 20 cm and 100cm marks respectively. Determine the position at which a 10N weight should be suspended in order to balance the system. (3 marks)

13. **Figure** 3 shows two possible designs of a three legged stool.

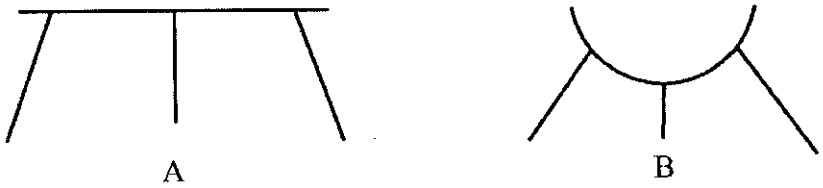

Figure 3

State a reason why B is more stable than A.(1 mark)

SECTION B: (55 marks)

*Answer **all** the questions in this section in the spaces provided.*

14. (a) A tape attached to an accelerating trolley passes through a ticker timer that makes dots on it at a frequency of 50 Hz. The ticker timer makes 10 dots on a 10cm long tape such that; the distance **a** between the first two dots is 0.5 cm and the distance **b** between the last two dots is 1.5 cm.

(i) Determine the velocity of the trolley at:

(I) distance a, (4 marks)

(II) distance b, (2 marks)

(ii) Determine the acceleration of the trolley. (3 marks)

(b) State with a reason what would be observed on the spacing between the dots on the tape when the trolley is made to move on a horizontal surface. (2 marks)

15. (a) A student was provided with several identical masses, a metre rule, a spring and a stand, boss and clamp. Outline five steps that the student should follow in order to verify Hooke's law. (5 marks)

(b) **Figure 4** shows a graph that was drawn from the results obtained in an experiment to study the extension of a spring.

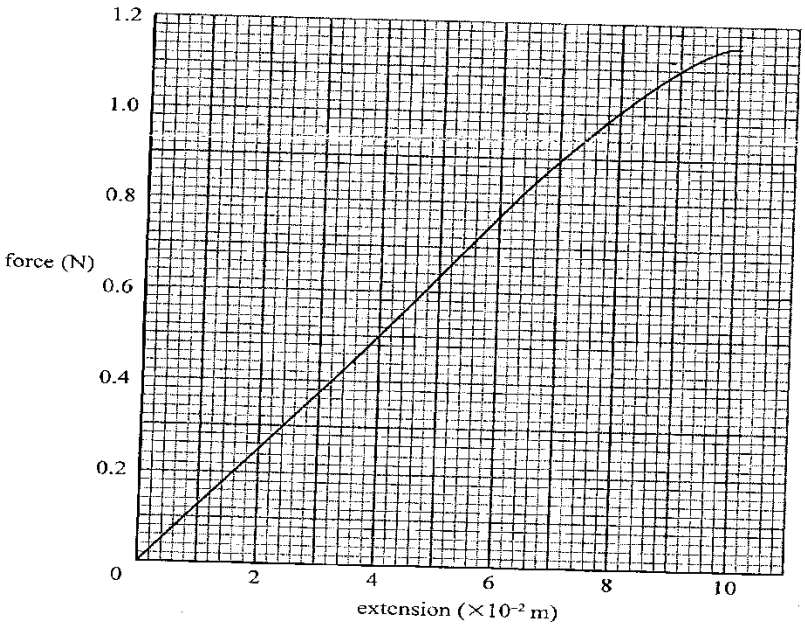

Figure 4

From the graph determine;

(i) The spring constant K,(3 marks)

(ii) The load that causes an extension of 3 X 10^{-2} m.(1 mark)

(c) Three identical springs of spring constant 100 Nm^{1} are arranged as shown in **Figure** 5 to support a 5 N load.

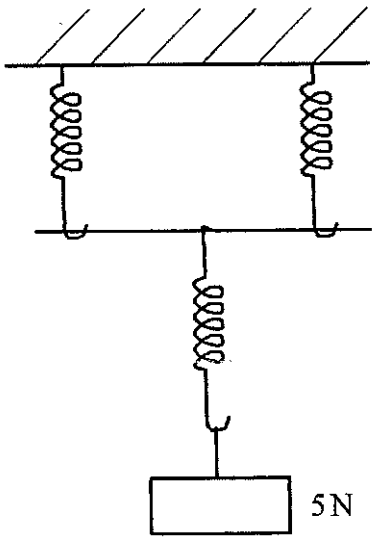

Figure 5

Determine the total extension in the arrangement.(3 marks)

16. (a) In an experiment to determine the size of an oil molecule, oil is placed on the surface of water after sprinkling lycopodium powder on it.

(i) State **two** reasons why oil is used.(2 marks)

(ii) State the function of the lycopodium powder.(1 mark)

(iii) State **any two** assumptions that are made in this experiment.(2 marks)

(iv) Explain why the oil spreads on the surface of water.(2 marks)

(b) The following data was obtained from an experiment to determine the size of a palm oil molecule.

- Volume of 100 drops of palm oil = $15.0mm^3$
- Area of a patch from one drop of oil - $8.0 \times 10^4 mm^2$

Determine the size of a palm oil molecule.

(3 marks)

17. (a) State the law of flotation.(1 mark)

(b) **Figure** 6 shows two solids W and X made of the same material and immersed in water.

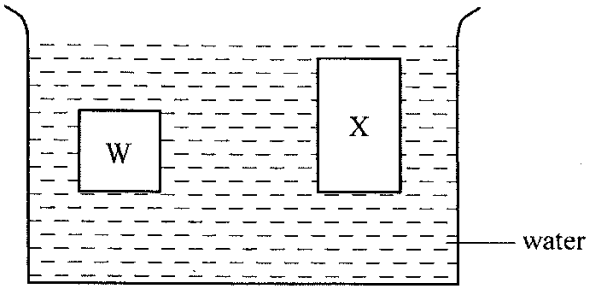

Figure 6

(i) State with a reason which one of the containers experiences a greater upthrust.(2 marks)

(ii) Solid W weighs 12 N in air, 2N in water and 4N in another liquid. Determine the density of the other liquid. (3 marks)

(c)**Figure 7** shows two identical wooden blocks each of mass 0.2kg suspended in water by twostrings **M** and **N**.

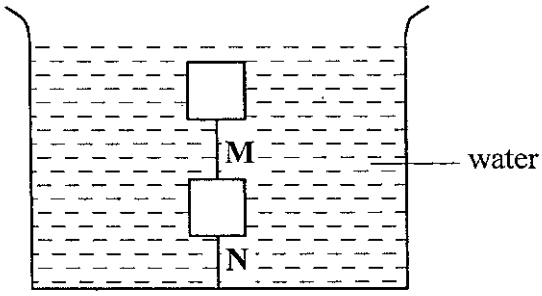

Figure 7

Given that the upthrust on each block is 3.2N, determine the tension in string;

(i) M, (2 marks)

(ii) N. (2 marks)

(d) State any one application of hydrometers.(1 mark)

18. (a) Figure 8 shows part of a hydraulic brake system.

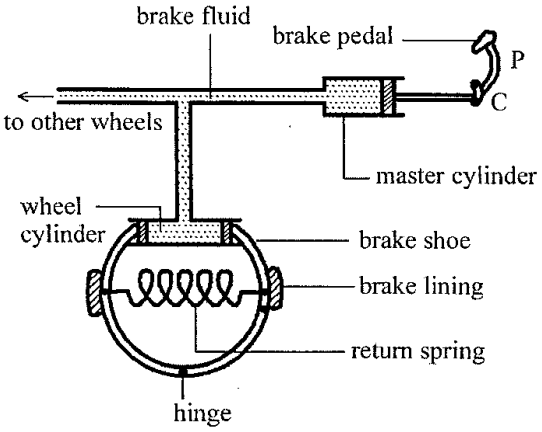

Figure 8

Describe how the systems works.(5 marks)

(b) State **three** conditions necessary for a driver to negotiate a bend on a flat level road at a relatively high speed. (3 marks)

c)Figure 9 shows two identical cans U and V each with a small opening at the top. Different amounts of water were put into the cans and heated until the water started to

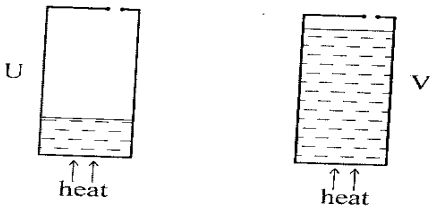

Figure 9

Explain what will be observed when both cans are then suddenly dipped into a cold waterbath. (3 marks)

KCSE PHYSICS 2017
PAPER 2

SECTION A: (25 marks)

*Answer **all** the questions in this section in the spaces provided,*

1. State any **two** uses of microwaves.(2 marks)

2. In a laboratory there are four metals - *tin, nickel, copper and cobalt.* Of these metals, name the metals that are;

(a) magnetic, (1 mark)

(b) non-magnetic. (1 mark)

3. State **one** use of echoes. (1 mark)

4. State what is meant by *polarisation*in simple cells. (1 mark)

5. State **two** advantages of using convex mirrors to monitor movements in a large supermarket. (2 marks)

6. **Figure 1** shows an insulated wire wound on a U-shaped iron core connected to a battery.

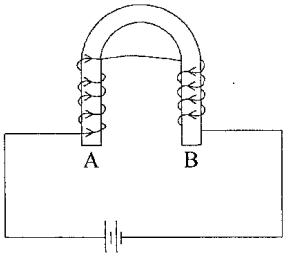

Figure 1

Determine the polarity of A.(1 mark)

7. Explain how the *greenhouse* gets warm. (2 marks)

8. Draw a circuit diagram to show a*p-n* junction diode in the forward biased mode. (1 mark)

9. **Figure** 2 shows a virtual image I formed by a convex lens.

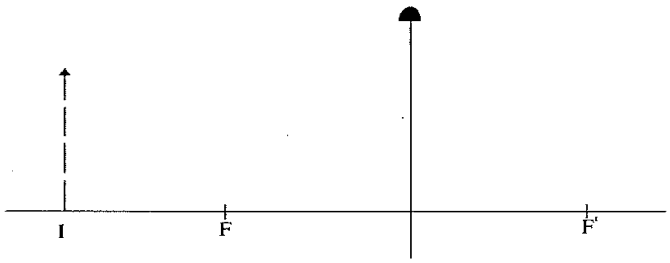

Figure 2

Draw a ray diagram to locate the object. (3 marks)

10.Write an equation to show how an element ${}_{Z}^{A}X$ decay to element Y by emitting a beta particle. (1 mark)

11. Explain what is observed when an uncharged sphere is brought close to a positively charged electroscope. (3 marks)

12. **Figure** 3 shows a transverse wave.

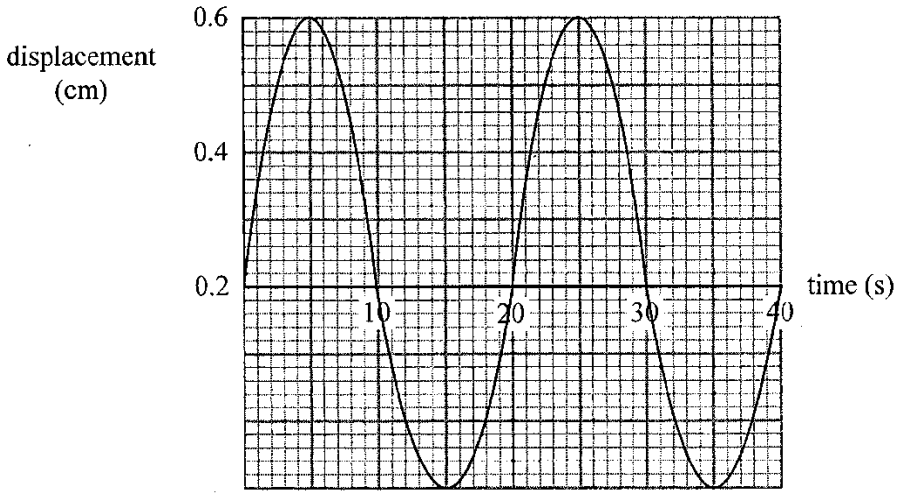

Figure 3

Determine the frequency of the wave.(2 marks)

13. **Figure 4** shows three resistors connected in series.

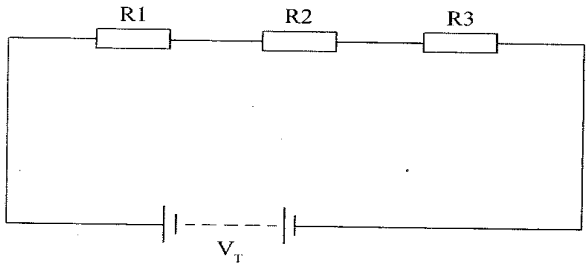

Figure 4

Using Ohm's law, show that the effective resistance is given by the expression: $RT=R1 + R2 + R3$ (3 marks)

14. State how heating is achieved in a resistance wire. (1 mark)

SECTION B: (55 marks)

Answer all the questions in this section in the spaces provided.

15. (a) **Figure 5** shows the interface between glass and air.

Air

Glass

Figure 5

Draw on the figure a ray diagram to illustrate the critical angle.(3 marks)

(b)**Figure 6** shows a ray of light incident at right angles to face AB of a right angled glass prism of refractive index 1.62.

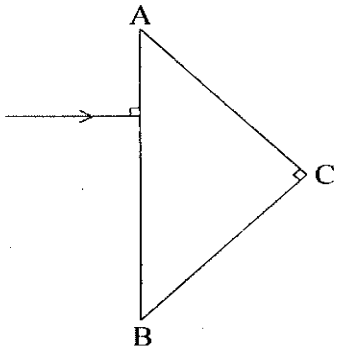

Figure 6

(i) Determine the critical angle of the material. (3 marks)

(ii) Complete the ray diagram to show the path of light until it leaves the prism.(2 marks)

(c) State any **two** applications of prisms.(2 marks)

16. (a) **Figure** 7 shows a set up that may be used to observe photoelectric effect. A radiation is incident on the cathode. It is observed that the microammeter registers a current.

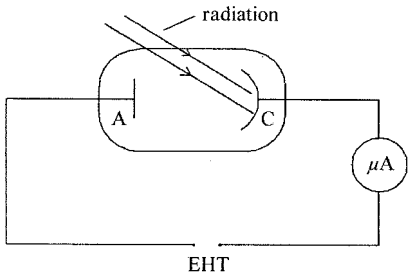

Figure 7

(i) Explain how the current is produced.(2 marks)

(ii) State with a reason what must be done for a higher current to be registered.(2 marks)

(iii) It was observed that for a certain incident radiation, no current was registered. Explain this observation. (2 marks)

b) A monochromatic light of wavelength 4.50 X 10^{-7} m is incident on a metal surface of threshold frequency 5.5 X 10^{14} Hz. *(Speed of light c is 3.0* X *10^{8} ms^{-1} andplanks constant his 6.63* X *10^{-34}Js).*

Determine

(i) the work function of the metal surface,(3 marks)

(ii) average kinetic energy of the emittal photoelectrons.(4 marks)

17. (a) **Figure** 8 shows a conductor AB connected to a galvanometer and placed between two permanent magnets.

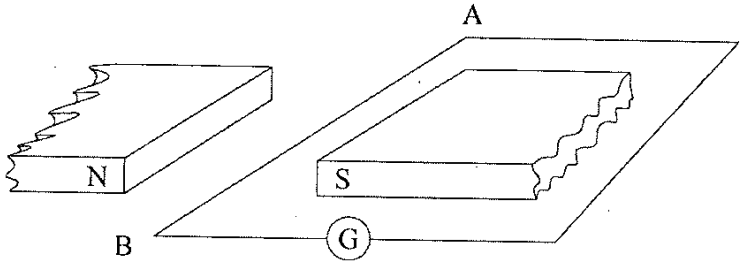

Figure 8

i) Conductor AB is moved perpendicular to the magnetic field. State and explain the observation made on the galvanometer. (3 marks)

(ii) State the effect of moving the conductor faster.(1 mark)

(b)A transformer is used to step down 240 V to 12V for use in an electric appliance operating at 0.5 A. If the primary coil has 600 turns, determine the;

(i) number of turns in the secondary coil,(3 marks)

(ii) current in the primary coil.(3 marks)

18. (a) State **two** factors that affect the capacitance of a parallel plate capacitor. (2 marks)

(b) **Figure 9** shows an electric circuit in which three capacitors are connected across a power supply. (2 marks)

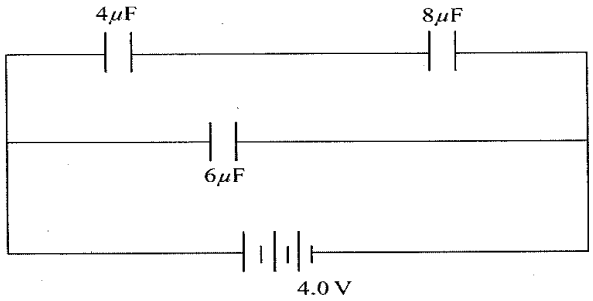

Figure 9

Determine the;

(i) total capacitance,(4 marks)

(ii) quantity of charge stored on the 8μF capacitor.(3 marks)

19. (a) **Figure** 10 shows a block diagram of a cathode ray oscilloscope (CRO).

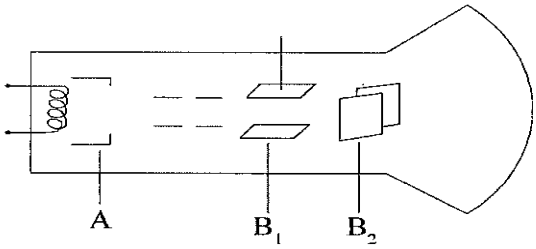

Figure 10

Figure 10

(i) State the names of the parts labelled B_1 and B_2 (2 marks)

(ii) State and explain the function of the part marked A.(3 marks)

Figure 11 shows a trace of a signal observed on the screen of a CRO. The time-base setting is 20 mscm-^{1}.

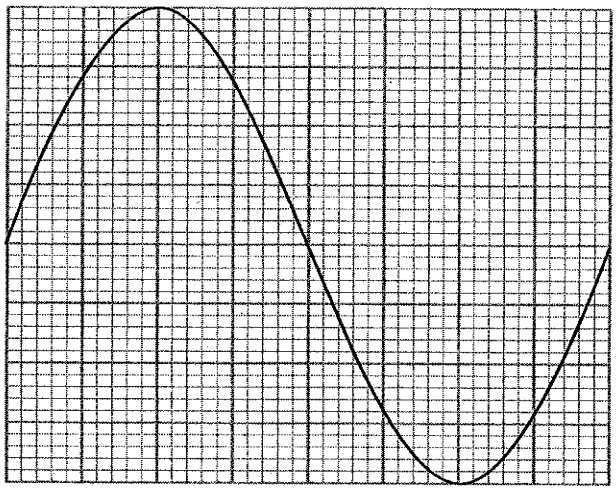

Figure 11

Determine the frequency of the signal.(4 marks)

(c) Explain why tunsten is used as a target in an x-ray tube.(2 marks)