

UCE MOCK EXAMINATIONS 2015  
PHYSICS  
PAPER 2  
TIME: 1 ½ HOURS

**Instructions:**

- Attempt any **three** questions
- Draw a table indicating the questions you have answered
- Where necessary use acceleration due to gravity =  $10\text{ms}^{-2}$
- Speed of light in air =  $3.0 \times 10^8$  m/s
- Speed of sound in air = 330m/s

1. (a) Define the following terms

- (i) atomic number (1 mark)  
 (ii) mass number (1 mark)  
 (iii) Isotopes (1 mark)

(b) Describe the composition of  ${}_{92}^{235}\text{U}$  atom

(c) A radioactive nuclide  ${}_{88}^{226}\text{X}$  emits an alpha particle and two Beta particles and turns into another nuclide Y

- (i) write a balanced equation to represent this nuclear change (2 marks)  
 (ii) How is X and Y related? (1 mark)  
 (iii) State any three differences between alpha and beta particles (3 marks)

(d) The table below shows the count rate of certain radioactive material

Count rate/ $\text{s}^{-1}$	6400	5380	3810	2700	1910
Time/s	0	60	180	300	420
	1350				
	540				

Plot a graph and use it to determine the half life of the material. (5 marks)

2. (a) With the aid of a labeled diagram, describe an experiment to show the relationship between the volume and temperature of a fixed mass of a gas at atmospheric pressure. (6 marks)

(b) A cylinder with a movable piston contains  $125\text{cm}^3$  of air at a temperature of  $47^\circ\text{C}$ . Calculate the volume of the gas if it is cooled to  $-23^\circ\text{C}$  at constant pressure (3 marks)

(c) Define the term specific heat capacity. (1 mark)

(d) A brass block 67 500g is heated to a temperature of 400°C and then dropped into a copper calorimeter of mass 300g which contains 600g of water at 10°C.

- (i) Calculate the maximum temperature attained by the water. (4 marks)
- (ii) Sketch a graph to show the variation of temperature of water with time. (2 marks)

3. (a) (i) Explain what is meant by moment of a force  
 (ii) State the principle of moments

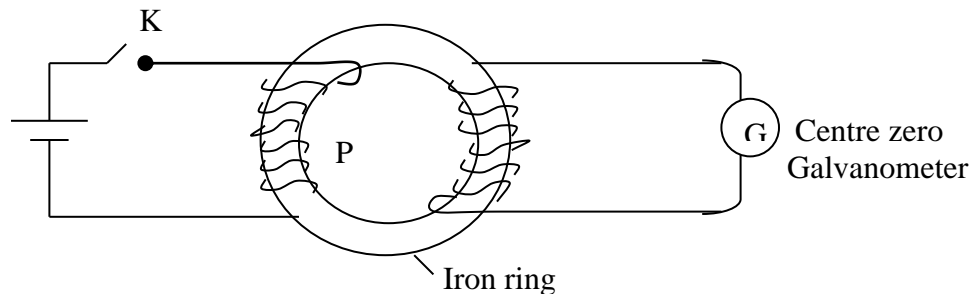
(b) A uniform rod of 1m long of mass 50g is supported horizontally on two knife edges, plated 10 cm from its ends. What will be the reaction at these supports when a 100g mass is suspended 10cm from the mid-point of the rod?

(c) Explain how you would determine the mass of a closed umbrella if you were given a metre rule, a knife edge and a 50g mass.

- (d) (i) Explain what is meant by a centre of gravity and stable equilibrium.  
 (ii) Explain why a bus with the luggage loaded in its deck is more stable than a bus with the luggage loaded on the rack on its roof.

4. (a) What is a transformer?

(b)



The diagram in the figure above shows a model of a transformer in which the primary coil P is connected to a d.c. source and the secondary coil S is connected to a galvanometer.

- (i) What is observed just as the switch K is closed?
- (ii) What would be the effect of closing switch K very fast
- (iii) What is observed when the switch K is left closed
- (iv) What is observed just as switch K is opened?
- (v) What would be observed if the d.c. source is replaced by an a.c source of low frequency?

(b) A transformer of efficiency 80% is connected to a 240 a.c. supply to operate a heater of resistance 240Ω. If the current flowing in the primary circuit is 5A

- (i) Calculate the potential difference (p.d) across the heater .

- (ii) If the transformer is cooled by oil of specific heat capacity  $2100 \text{ J kg}^{-1} \text{ K}^{-1}$  and the temperature of oil rises by  $20^\circ\text{C}$  in 3 minutes, find the mass of the oil in the transformer.
5. (a) (i) Describe a simple experiment to determine the velocity of sound in air
- (ii) What factors would affect the values of the velocity of sound obtained from the experiment in (i) above?
- (b) Why a musical note played on a piano sounds different from that played on a guitar
- (c) (i) Calculate the wavelength of sound waves of frequency  $3.3 \text{ kHz}$  and speed  $330 \text{ ms}^{-1}$
- (ii) state four differences between sound and radio waves.

End