535/2
PHYSICS PAPER 2
August 2019
2¼ hours

MOCK EXAMINATIONS 2019

Uganda Advanced Certificate of Education

PHYSICS

PAPER 2

2 hours 15 minutes

INSTRUCTIONS TO CANDIDATES

Attempt any **five** questions.

Answers to any extra questions will **not** be marked.

These values of physical quantities may be useful to you:

Acceleration due to gravity, g	=	10 ms^{-2}
Density of water	=	1,000 kgm^{-3}
Specific heat capacity of copper	=	400 $Jkg^{-1}K^{-1}$

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1. (a) (i) Define acceleration. (1 mark)
   (ii) State the principle of conservation of momentum. (1 mark)

   (b) Describe an experiment to determine acceleration due to gravity using a pendulum bob. (5 marks)

   (c) A car travelling at 20 ms^{-1} is brought to rest over a distance of 50 m after the brakes are applied.
   (i) Calculate its retardation. (2 marks)
   (ii) Determine the time it takes to stop. (2 marks)
   (iii) Sketch a velocity-time graph for the motion. (1 mark)

   (d) Explain why an object falling from a great height will attain a constant velocity. (4 marks)

2. (a) (i) Draw a labeled diagram showing the formation of an image in a pinhole camera. (3 marks)
   (ii) Explain the effect of increasing the size of the pinhole. (2 marks)
   (iii) The length of a pinhole camera is 20 cm. Determine the height of a storey building 300 m away from the pinhole if the image formed on the screen of the pinhole camera is 2.5 cm high. (3 marks)

   (b) Explain why you cannot see your image on a piece of paper. (2 marks)
   (c) State the laws of refraction of light. (2 marks)

   (d) The diagram in Fig. 1 shows a ray of yellow light incident in glass of refractive index 1.5 at an angle of 30° in a dark room.

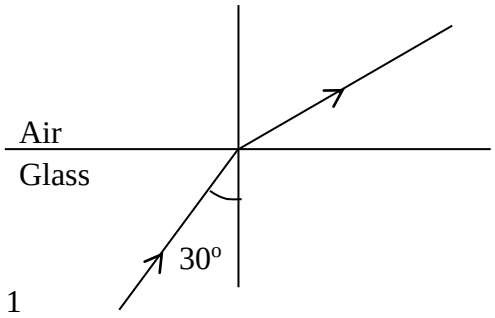


Fig. 1

   (i) Determine the angle of refraction in air. (3 marks)
   (ii) What would be observed if a ray of white light instead of yellow light is used? (1 mark)

3. (a) (i) State the factors which determine the pressure acting on the surface of a solid. (2 marks)

(ii) A liquid of density, ρ is filled to a depth h in a cylindrical tin of cross-sectional area, A. Derive an expression for the pressure exerted at the bottom of the tin by the liquid. (3 marks)

(b) A hole of area 2.0×10^{-4} m^2 at the bottom of a tank 2.0 m deep is closed with a cork. Determine the force on the cork when the tank is filled with water. (4 marks)

(c) Define the following terms as applied to machines:

(i) velocity ratio. (1 mark)

(ii) efficiency. (1 mark)

(d) In a hydraulic jack, the effort piston has an area of 2.83×10^{-3} m^2 while the load piston is of area 4.52×10^{-2} m^2. If an effort of 80N is applied,

(i) determine the load raised. (3 marks)

(ii) explain why gases are not used in the transmission of pressure in machines. (2 marks)

4. (a) Define the following terms as applied to waves:

(i) Amplitude. (1 mark)

(ii) Frequency. (1 mark)

(b) Plane wave fronts are propagating towards a concave barrier as shown in Fig. 2

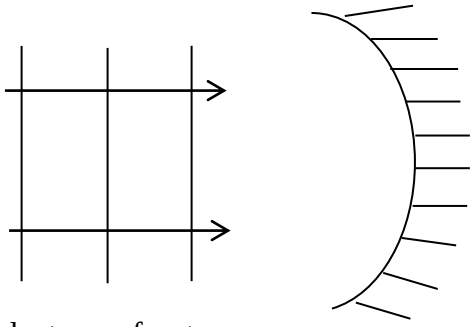


Fig. 2

Incident wavefronts

Draw and complete the diagram to show the resulting waves after striking the barrier. (3 marks)

(c) (i) Describe an experiment to determine the speed of sound in air using the echo method. (5 marks)

(ii) A radio station transmits a radio signal at a frequency of 2.5 MHz. Calculate the

wavelength of the signal. (3 marks)

. (d) State the reason why a closed pipe produces less quality sound than an open pipe. (1 mark)

(e) Give **two** similarities between sound waves and radio waves. (2 marks)

5. (a) State Ohm's law. (1 mark)

(b) With the aid of a circuit diagram, describe an experiment to determine the internal resistance of a dry cell. (6 marks)

(c) The circuit in Fig. 3 shows resistors connected to a battery of e.m.f. 9 V and negligible internal resistance.

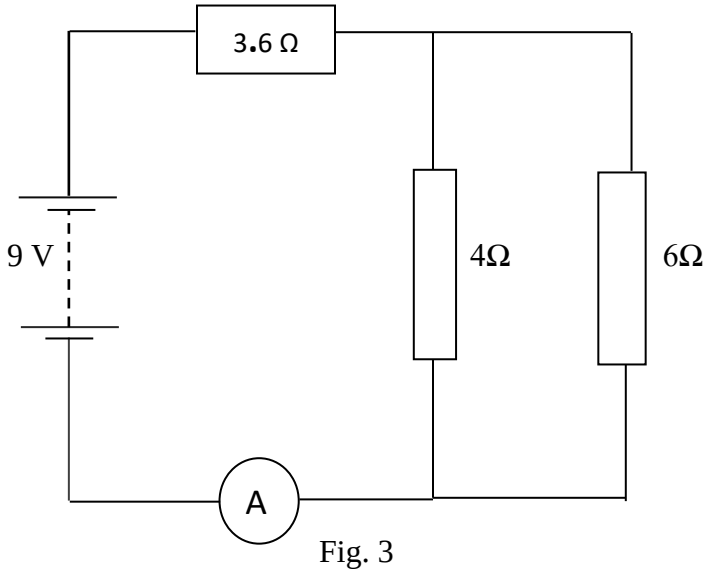


Fig. 3

Calculate the:

(i) total resistance of the circuit. (3 marks)

(ii) ammeter reading. (2 marks)

(d) Explain why bulbs in a long corridor are not wired in series. (1 mark)

(e) Give any **three** ways of maintaining a lead-acid accumulator. (3 marks)

6. (a) (i) State the three methods of heat transfer. (3 marks)

. (ii) The diagram in Fig. 4 shows a simple fire alarm used in a factory.

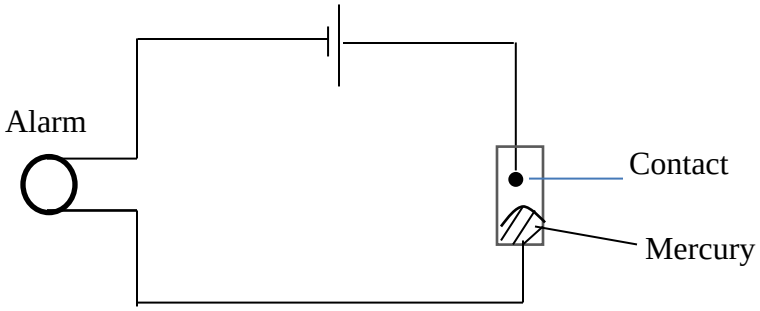


Fig. 4

Describe how it works. (3 marks)

(b) (i) You are provided with an uncalibrated mercury-in-glass thermometer. Describe how the thermometer can be calibrated. (Diagrams are not necessary) (5 marks)

. (ii) The fundamental interval of a mercury –in-glass thermometer is 18.0 cm. What temperature is recorded in ^{o}C when the mercury thread is 14.5 cm above the lower fixed point. (2 marks)

(c) (i) What is meant by specific heat capacity? (1 mark)

(ii) A piece of copper of mass 250 g at 20 ^{o}C is heated to a temperature of 70 ^{o}C. Find the heat energy supplied. (2 marks)

7. (a) Define the following terms:

(i) Isotopes (1 mark)

(ii) Atomic number. (1 mark)

(b) (i) State the nature of the emissions from radioactive nuclides. (3 marks)

(ii) What effect does each of the emissions have on the parent nuclide? (3 marks)

(c) A sample of radon $^{222}_{86}Ra$ decays by emission of one alpha particle. Write a nuclear equation for this reaction. (3 marks)

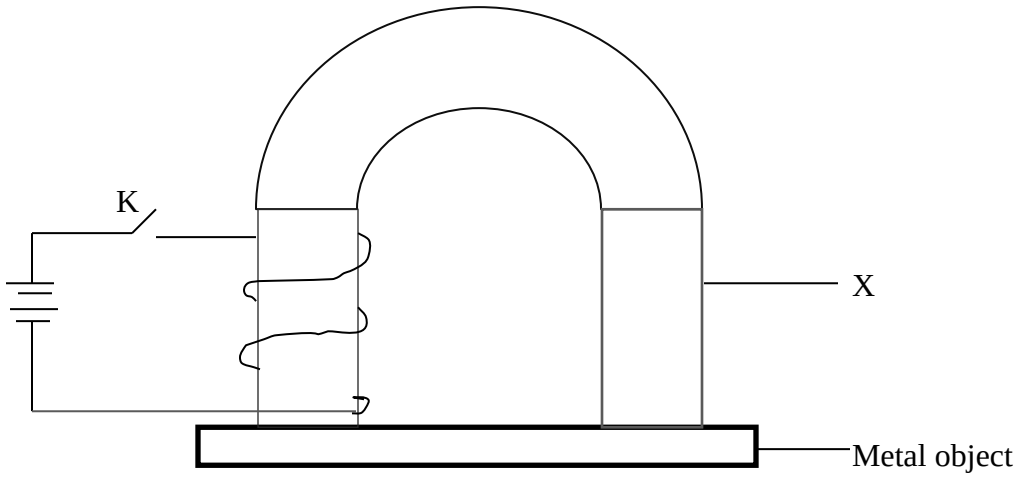
(d) Nuclide K has a half life of 2.5 hours. What percentage of the original number of atoms of the radioisotope would be left after 10 hours? (3 marks)

(e) Give **two** medical uses of radioactivity. (2 marks)

8. (a) Describe how the poles of a magnetized piece of steel can be determined. (4 marks)

(b) Sketch the magnetic field between south poles of two bar magnets clearly indicating the position of the neutral point. (3 marks)

(c) Fig. 5 shows an electromagnet made by a student in the laboratory. The magnet is meant to pick up and release a metal object.



(i) Name part X and give **two** reasons why it is suitable for its purpose. (3 marks)

(ii) The electromagnet will just lift a metal of mass 200 g. Determine the least force exerted by the magnet to do this. (2 marks)

(iii) State the changes which the student should make so that a heavier metal object could be lifted by the magnet. (2 marks)

(iv) Give the reason why the strength of the above magnet cannot be increased indefinitely. (1 mark)

(d) Give **one** method of demagnetizing a bar magnet. (1 mark)

END