MID TERM TWO
PHYSICS SENIOR THREE
PAPER TWO
2 HOURS

INSTRUCTIONS TO CANDAIDATES

- Attempt any FOUR questions
- Any additional question(s) answered will not be marked

Assume where necessary;

- Acceleration due to gravity = $10ms^{-2}$
- Density of water = $1000kgm^{-3}$
- Speed of electromagnetic waves = $3.0 \times 10^{8}ms^{-1}$
- Specific heat capacity of water = $4200Jkg^{-1}k^{-1}$

1.(a) Define momentum (1 mark)

(b) A moving ball, A of mass 0.100kg collides with a stationary ball, B of mass 0.200kg. After collision, A moves back wards with a velocity of $2ms^{-1}$ while B moves forward with a velocity of $5ms^{-1}$. Calculate the;

(i) initial velocity of A, (3 marks)

(ii) force exerted by A and B if the collision took 0.05 seconds. (3 marks)

(c) State Newton's laws of motion. (3 marks)

(d) Explain why a long jumper should normally land on sand. (3 marks)

(e) Explain what happens when a balloon is filled with air and then released in space without tying its open end. (3 marks)

2. (a) State;

(i) Archimede's principle (1 mark)

(ii) the law of flotation (1 mark)

(b) A block of wood of volume $300cm^3$ floats on water with ¾ of its volume immersed. Find the;

(i) mass of the wooden block (3 marks)

(ii) fraction of the block that sinks when it is placed in oil of density $0.842gcm^{-3}$. (3 marks)

(c) A small steel ball is allowed to fall centrally down a tall cylinder containing lubricating oil.

(i) Sketch a velocity – time graph for the motion of the ball. (1 mark)

(ii) Describe the features of the graph. (3 marks)

(d) Describe an experiment to demonstrate the existence of surface tension.

(4 marks)

3.(a) State the laws of reflection of light (2 marks)

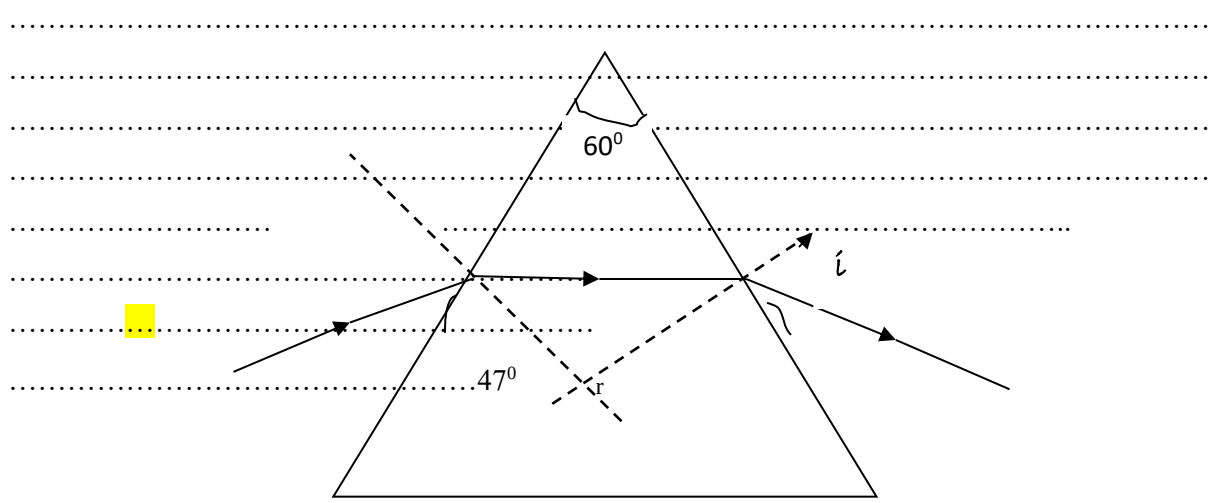
(b) Describe an experiment to demonstrate the principle of reversibility of light.

(4 marks)

(c) An object is released from a height of 20m above a plane mirror. What distance must it drop through in order to be 10m away from its image?

(3 marks)

(d) The diagram below shows a ray of light incident at an angle of 47^0 on one surface of an equilateral triangular prism immersed in a liquid of refractive index 1.33.



Given that there refractive index of glass is 1.5, Calculate the;

(i) angle of refraction, r (2 marks)

(ii) emergent angle, **i** (2 marks)

(e) (i) What is meant by focal length of a lens? (1 mark)

(ii) Calculate the power of a concave lens of focal length 20cm. (2 marks)

4.(a) Define the following terms

(i) atomic number (1 mark)

` (ii) isotopes of an element (1 mark)

(b) (i) What is half life of a radioactive material (1 mark)

(ii) A radioactive material has a half life of 10 years. If after 30 years, 250g of it is remaining, determine the initial mass of the material. (4 marks)

(c) What are x – rays? (1 mark)

(d) Explain briefly how each of the following can be increased in an x – ray tube;

(i) intensity of x – rays. (3 marks)

(ii) penetrating power of x – rays. (3 marks)

5.(a) Define the following terms.

(i) amplitude (1 mark)

(ii) wave length (1 mark)

(b) The distance between two successive antinodes on a stationary wave is 4.0cm. If the distance between the source of the wave and reflector is 32.0cm, find the;

(i) number of loops (3 marks)

(ii) wave length of the wave. (2 marks)

(c) (i) Use a labeled diagram to show the bands of an electromagnetic spectrum. (3 marks)

(ii) Calculate the frequency of a radio wave of wavelength 2m (3 marks)

(d) State three differences between light waves and sound waves. (3 marks)

6.(a) State the law of electrostatics (1 mark)

(b) Explain briefly how a conductor can be charged negatively by induction. (5 marks)

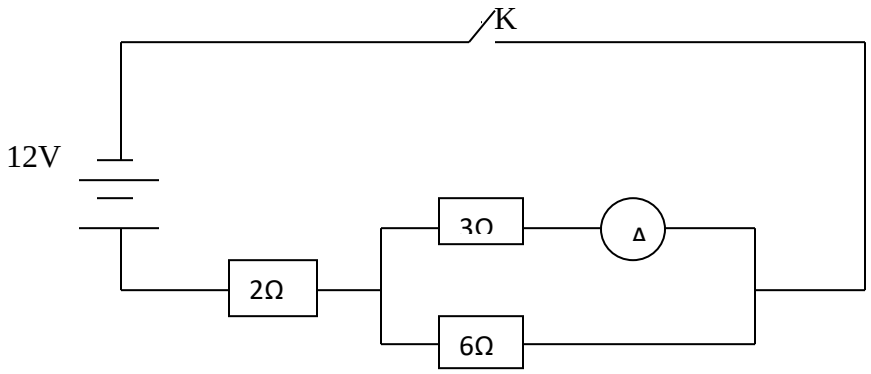
(c) Describe how a gold leaf electroscope can be used to determine the sign of charge on a given charged body. (5 marks)

(d) Explain how leakage of charge occurs at the ends of sharp conductors. (5 marks)

7.(a) Define the terms e.m.f and internal resistance of a cell. (2 marks)

(b) With the aid of a circuit diagram describe how you can determine the internal resistance of a cell. (5 marks)

(c) A battery of e.m.f 12V and negligible internal resistance is connected to resistances 2Ω, 3Ω and 6Ω as shown in the figure below.



Find the reading of the ammeter, A when K is closed. (6 marks)

(d) A house has one 100W bulb, two 75 W bulbs and five 40W bulbs. Find the cost of having all these bulbs switched on for 2 hours every day for 30 days at a cost of 600 shillings per unit. (3 marks)

8.(a) (i) Define the term conduction. (1 mark)

(ii) Describe with the aid of a diagram an experiment to show that water is a poor conductor of heat. (4 marks)

(b) (i) Define specific heat capacity. (1 mark)

(ii) The same quantity of heat was supplied to 5kg of sea water and 12kg of alcohol. The temperature rise was 3^0C and 2^0C respectively. Find the ratio of the specific head capacity of sea water to that of alcohol. (4 marks)

(c) Explain why a bare cement floor feels colder than carpeted one. (2 marks)

(d) Describe with the aid of a labeled diagram an experiment to show the effect of increase in pressure on the melting point of ice. (4 marks)

END