WARNING: You must return this section with your answer book otherwise marks will be lost.

Write Your Examination Number here

AN ROINN OIDEACHAIS

LEAVING CERTIFICATE EXAMINATION, 1995

PHYSICS — ORDINARY LEVEL

THURSDAY, 15 JUNE — AFTERNOON 2.00 to 5.00

Answer **all** questions in Section A.

Answer **two** questions from Section B and **three** questions from Section C.

SECTION A (120 marks)

Answer each question in this section.
Each question carries the same number of marks.
Write your answers in the spaces provided.
Write your examination number at the top.
Be sure to return this section of the examination paper, enclosing it in the answer book you use in answering Section B and C.

---

1. Answer *five* of the following items, (i), (ii), (iii) etc. In the case of each item write the letter corresponding to the correct answer in the box provided.

(i) A force of 50 N acts on a body of mass 10 kg. The acceleration produced is

A. 5000 $m\ s^{-2}$
B. 500 $m\ s^{-2}$
C. 5 $m\ s^{-2}$
D. 0.5 $m\ s^{-2}$
E. 0.2 $m\ s^{-2}$.

Answer ☐ (6)

(ii) The unit in which the moment of a force is measured is

A. pascal
B. watt
C. newton second
D. newton metre
E. kilogram metre.

Answer ☐ (6)

(iii) Which of the following have the highest frequency?

A. Microwaves
B. Ultra-violet rays
C. Radio waves
D. Infra-red waves
E. Gamma rays.

Answer ☐ (6)

(iv) The symbol in Fig. 1 represents a

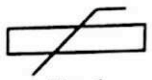

Fig. 1

A. diode
B. capacitor
C. rheostat
D. light dependent resistor
E. thermistor.

Answer ☐ (6)

(v) A transformer may be used to

A. increase or decrease a.c. voltages
B. switch a circuit
C. generate a.c.
D. store charge
E. generate d.c.

Answer ☐ (6)

(vi) In a nuclear fission reactor, the moderator

A. is a coolant
B. slows down the neutrons
C. is an isotope of uranium
D. is a plasma
E. controls the rate of reaction.

Answer ☐ (6)

2. Answer *five* of the following.

(i) Archimedes' principle states that where a body is wholly or partly immersed in a fluid the upthrust (or apparent loss of weight) is equal to .....

..... (6)

(ii) A horizontal force (P) pulls a block of wood of weight mg over a rough horizontal surface (Fig. 2).

Name and indicate clearly on the diagram another force that acts on the block.

Name ..... (6)

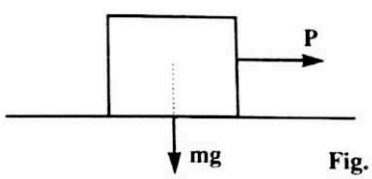

Fig. 2

(iii) Heat is transferred in liquids and gases mainly by ..... (6)

(iv) The electric bell in Fig. 3 is ringing. What change would be noticed if the air were pumped out of the bell jar?

.....

..... (6)

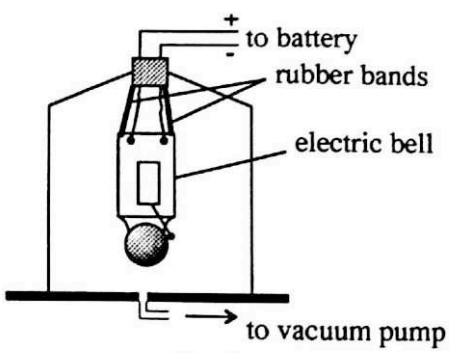

Fig. 3

(v) Fig. 4 shows an optical fibre. The light ray shown passes through the glass A which is coated with another type of glass. Complete the sketch to show the passage of the light ray through the fibre. (6)

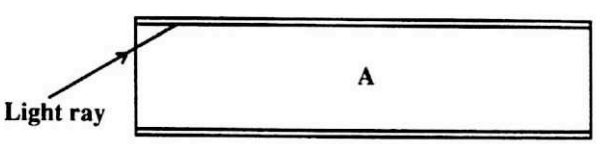

Fig. 4

(vi) Give one application of the photoelectric effect.

..... (6)

3. Answer *five* of the following.

(i) Calculate the speed of a light wave of wavelength 4.76×10^{-7} m and frequency 6.3×10^{14} Hz .....

..... (6)

(ii) The magnified image of an object which is formed by an astronomical telescope is.....

and ..... (6)

(iii) White light may be dispersed using a .....

or using a ..... (6)

(iv) Give an everyday example of the dispersion of white light.....

..... (6)

(v) The three primary colours are....., ... and ..... (6)

(vi) An emission spectrum is produced when.....

..... (6)

4. An arrangement for measuring the electrochemical equivalent of copper is shown in Fig. 5.

Answer *five* of the following.

(i) Faraday's first law of electrolysis states that the mass of a substance liberated or deposited during electrolysis is proportional to

.....

.....

.....

..... (6)

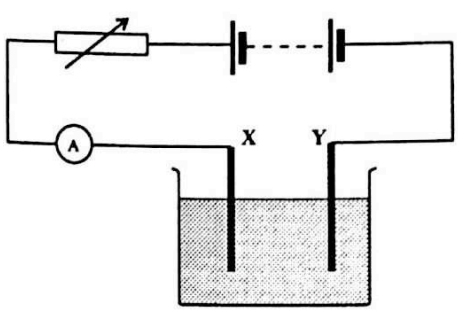

Fig. 5

(ii) What is the name given to the electrode X in Fig. 5? ..... (6)

(iii) At which electrode is the copper deposited during the experiment? .....(6)

(iv) How is the current kept constant during the experiment? .....

.....(6)

(v) The electrochemical equivalent of copper is 3.3×10^{-7} kg C^{-1}. Calculate the mass of copper deposited by a current of 2 A passing for 5 s. .....

..... (6)

(vi) Give an industrial application of electrolysis. ..... (6)

AN ROINN OIDEACHAIS

LEAVING CERTIFICATE EXAMINATION, 1995

PHYSICS — ORDINARY LEVEL

Section A is on a separate sheet which provides spaces for your answers. The completed sheet should be enclosed in your answer book.

Write your answers to Sections B and C in your answer book.

SECTION B (80 marks)

Answer **two** of the questions from this section.

Each question carries the same number of marks.

---

5. In a laboratory experiment to verify the principle of conservation of momentum, a student arranged two trolleys as shown in Fig. 6.

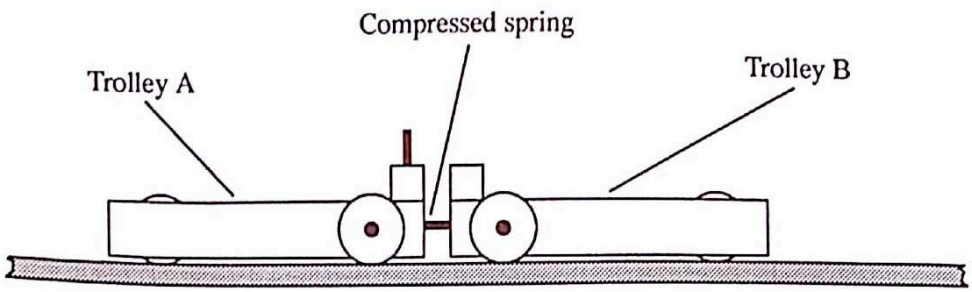

Fig. 6

When the compressed spring between them was released, the trolleys moved apart and the speed of each trolley was then measured.

(i) What apparatus might have been used to measure the speed of the trolleys? (6)

(ii) Explain how the apparatus in (i) could have been used to determine the speed of the trolleys. (12)

(iii) What other measurements would have been necessary in the experiment? (6)

(iv) State how the measurements would have been used to verify the principle of conservation of momentum. (9)

(v) Mention one precaution which should have been taken to ensure an accurate result. (6)

6. In a report on a laboratory experiment to verify Boyle's law a student wrote:

"The purpose of this experiment was to investigate the effect of pressure on the volume of a definite mass of gas at constant temperature. When all the readings had been taken a graph was plotted."

(i) Draw a labelled diagram of the apparatus which may have been used in the experiment. (9)

(ii) Explain how the pressure of the gas could have been measured. (6)

(iii) The following table shows the data which the student obtained in the experiment.

Pressure / kilopascals	100	140	180	220	260	300	340
Volume / cm^3	14.3	10.0	7.7	6.7	5.6	4.8	4.2

Plot a graph on graph paper of pressure against 1/volume. (18)

What conclusion may be drawn from the graph? (6)

7. A student used a monochromatic light source in an experiment to measure the wavelength of light.

(i) Sketch the apparatus which may have been used. (9)

(ii) Name a suitable monochromatic light source for this experiment. (6)

(iii) State the readings which the student would have taken in the experiment. (9)

(iv) Explain how these readings could be used to calculate the wavelength of the light from the monochromatic source. (9)

(v) State a precaution which should have been taken in order to ensure an accurate result. (6)

SECTION C (200 marks)

Answer **three** questions from this section.

Each question carries the same number of marks.

---

8. State Newton's law of gravitation. (9)

Give an expression for the relationship between G, the universal constant of gravitation and the acceleration due to gravity, g. (9)

Describe an experiment to determine the value of g. (24)

An object is dropped from rest at a height of 10 metres and falls to the ground. Calculate:

(i) the time which the object takes to reach the ground;

(ii) the speed of the object on reaching the ground.

(Take $g = 9.8 \text{ m s}^{-2}$.) (12)

Name a body in space on the surface of which you would expect to have:
(i) a value for g which is greater than on Earth's surface,
(ii) a value for g which is less than on Earth's surface. (12)

9. (a) Name *three* different types of thermometer. (9)

Describe an experiment to calibrate and use a thermometer. (24)

(b) Define specific heat capacity. (6)

Describe an experiment to compare the specific heat capacities of copper and water. (21)

The specific heat capacity of water is 4200 J kg^{-1} K^{-1}. Calculate the energy required to heat 10 kg of water from 10 °C to 100 °C. (6)

10. (a) "Longitudinal waves and transverse waves may be reflected and refracted".

Explain the underlined words. (12)

Give an example of each type of wave. (6)

Describe how the refraction of *either* a longitudinal wave *or* of a transverse wave may be demonstrated in the laboratory. (15)

(b) The natural frequency of vibration of a string depends on its length. How may this be demonstrated in the laboratory? (18)

State one other factor on which the natural frequency of a string depends. (6)

An arrangement of pendulums is shown in Fig. 7 suspended from a thick cord. When pendulum 'a' is set in motion the other pendulums also begin to oscillate. It is noted that pendulum 'd' oscillates with a greater amplitude than the pendulums b, c and e. Explain why this occurs. (9)

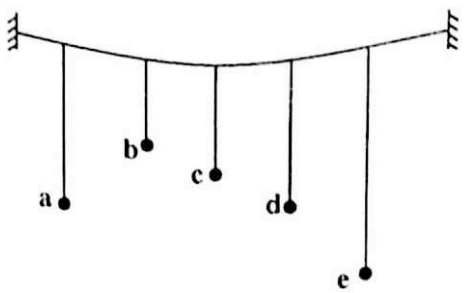

Fig. 7

11. (a) State Ohm's law. (9)

State two factors on which the resistance of a metallic conductor depends. (6)

Calculate:

(i) the total resistance in the circuit shown in Fig. 8; (12)

(ii) the current passing through the ammeter. (6)

(Take the resistance of the battery and ammeter as zero.)

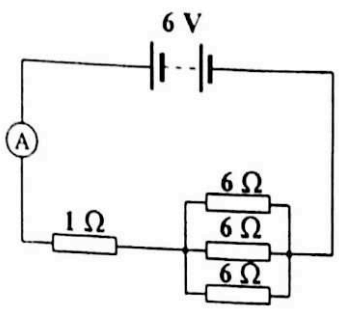

Fig. 8

(b) Give an expression for the force on a current-carrying conductor in a magnetic field. (6)

Fig. 9 shows a device which is based on the above principle. Name the device. (9)

Identify the parts labelled A and B. (12)

Give the function of the part labelled C. (6)

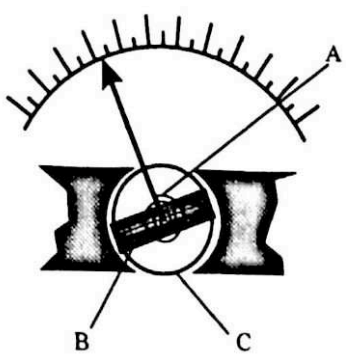

Fig. 9

12. (a) Give two properties of electrons. (6)

Describe how a beam of electrons is produced in a cathode ray tube. (15)

State *two* methods by which a beam of electrons may be deflected. (6)

Name a device in which a cathode ray tube is used. (6)

(b) What is meant by (i) p-type material, (ii) n-type material? (12)

Draw the circuit used in an experiment to plot the characteristic curve of a semiconductor diode. (12)

Sketch the graph which you would expect to obtain from this experiment. (9)

13. Answer any *two* of the following.

(a) State the principle of conservation of energy. (6)

A car of mass 1600 kg is moving with a velocity of 10 m s^{-1}. Calculate the kinetic energy of the car. Calculate the average force required to bring the car to a stop in a distance of 20 metres.
Explain what happens to the kinetic energy of the car when the brakes are applied and the car stops. (27)

(b) Draw a ray diagram to show the formation of a real image by a converging lens. (9)

An object 2 cm high is placed 10 cm from a converging lens of focal length 15 cm. Find the position, the height and the nature of the image formed. (18)

Give an everyday use of a converging lens. (6)

(c) What is meant by electromagnetic induction? (9)

Fig. 10 shows a simple a.c. generator. Explain how it works. (18)

Suggest an alteration that could be made in order to convert the generator into one which would generate a higher voltage. (6)

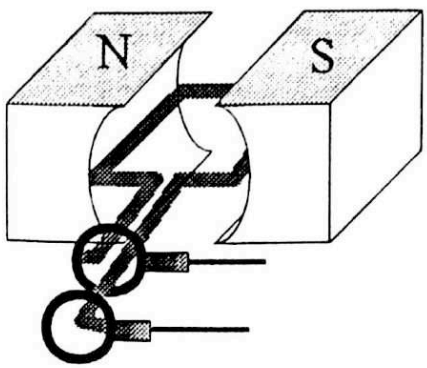

Fig 10

(d) An experiment was performed to measure the half-life of a short-lived radioactive isotope which emitted α-particles.

(i) What are α-particles? (6)

(ii) Name the detector which may have been used. (6)

(iii) Outline the procedure involved in the experiment. (21)