0015291

M. 57

Write your Examination Number here

AN ROINN OIDEACHAIS

LEAVING CERTIFICATE EXAMINATION, 1990

PHYSICS — ORDINARY LEVEL

FRIDAY, 15 JUNE — MORNING, 9.30 to 12.30

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 Sections 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) Vector quantities
- A. have length and mass
- B. are measured in joules
- C. have no direction
- D. have a magnitude and a direction
- E. have a magnitude only.

Answer ☐ (6)

(ii) Specific heat capacity is measured in
- A. $J\ kg^{-1}\ K^{-1}$
- B. J kg K
- C. $J\ kg^{-1}$
- D. $J\ K^{-1}$
- E. K

Answer ☐ (6)

(iii) Diffraction of light
- A. shows that light is a transverse wave motion
- B. occurs when light is passed through a prism
- C. occurs when light passes through an opening or past the edge of an obstacle
- D. occurs when light passes from one medium to another
- E. shows that light is a longitudinal wave motion.

Answer ☐ (6)

(iv) The angle of dip is the angle
- A. through which a pendulum swings
- B. between geographic north and magnetic north
- C. between the earth's magnetic field and the vertical
- D. between the earth's magnetic field and the horizontal
- E. through which a compass needle is deflected when it is placed near an electromagnet.

Answer ☐ (6)

P.T.O

(v) The effective resistance of the combination of resistors shown in Fig. 1 is

A. 0·083 Ω
B. 0·375 Ω
C. 2·667 Ω
D. 8·250 Ω
E. 12 Ω

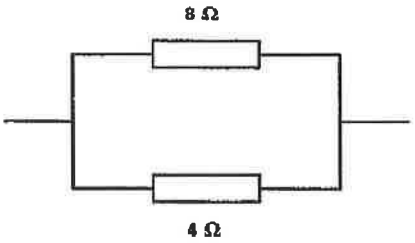

Fig. 1

Answer ☐ (6)

(vi) Beta particles are

A. protons
B. electrons
C. electromagnetic waves
D. uncharged particles
E. neutrons.

Answer ☐ (6)

2. Answer *five* of the following.

(i) What is meant by refractive index?.....

.....(6)

(ii) Two factors upon which the frequency of vibration of a string depends are .....

..... and .....(6)

(iii) What is the Doppler effect?.....

.....

.....(6)

(iv) Give an example of an electrolyte .....(6)

(v) Calculate the heat produced when a current of 2 A passes for 10 minutes through a conductor of resistance 5 Ω .....

.....(6)

(vi) Name a detector of radioactivity .....(6)

3. Answer *five* of the following.

(i) State the principle of conservation of momentum .....

.....

..... (6)

(ii) A newton is the force required to give a body of mass ..... an acceleration of..... (6)

(iii) Calculate the constant force required to increase the kinetic energy of an object by 500 J over a distance of 10 m ..... (6)

(iv) Give an expression for Newton's law of gravitation..... (6)

(v) Give an example of friction from everyday life.....

..... (6)

(vi) The magnitude of the forces between charges was investigated by .....

who performed his experiments during the .....century. (6)

4. Fig. 2 shows a hot cathode X-ray tube.

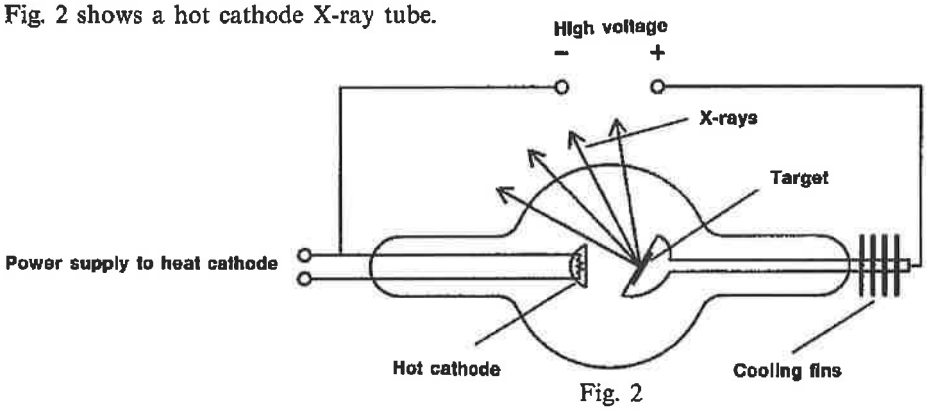

Fig. 2

Answer *five* of the following.

(i) What are X-rays?.....

..... (6)

(ii) What happens at the cathode when it is heated?.....

..... (6)

(iii) What is the function of the high voltage?.....

..... (6)

(iv) Of what material is the target usually made? ..... (6)

(v) Why are the cooling fins necessary? .....

.....

..... (6)

(vi) Give a precaution to be taken in the use of X-rays.....

..... (6)

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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.

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5. A student used a metre stick and other apparatus in an experiment to verify the principle of moments.

(i) Draw a labelled diagram to show the arrangement of the apparatus in this experiment. (9)

(ii) State the measurements which the student should have taken and explain how these measurements can be used to verify the principle of moments. (21)

(iii) Give a precaution which should be taken in this experiment. (9)

6. In a laboratory experiment to verify Boyle's law a series of readings was taken of the pressure and volume of a fixed mass of gas, at constant temperature.

(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 may have been measured. (6)

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

Pressure, p (kilopascals)	100	111	125	143	167	199	250
Volume, V (cm^3)	50·0	45·0	40·0	35·0	30·0	25·0	20·0

Draw a graph on graph paper of p against $1/V$.
Explain how the graph verifies Boyle's law. (24)

7. The following is part of a student's account of an experiment to plot the characteristic curve of a semiconductor diode.
"The circuit was set up as shown in the diagram. The potential difference across the diode was set to a low value and the current was then read. The potential difference was gradually increased and the current was read each time. After this a graph of current against potential difference was plotted."

(i) Draw a labelled circuit diagram to show the apparatus used in the experiment. (12)

(ii) Explain how the potential difference may have been varied in this experiment. (6)

(iii) Sketch the graph you would expect to obtain in this experiment. (9)

(iv) What would happen if too large a current were allowed to flow through the diode? (6)

(v) Give one use of a semiconductor diode. (6)

P.T.O.

SECTION C (200 marks)

Answer **three** questions from this section.

Each question carries the same number of marks.

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8. Define (i) acceleration, (ii) weight. (12)

Describe a laboratory experiment to measure g, the acceleration due to gravity. (30)

Give a precaution which should be taken to improve the accuracy of this experiment. (6)

A body of mass 6 kg takes 2 seconds to reach the ground when dropped from a height. Calculate (i) the height from which the body is dropped, (ii) the weight of the body.
(Take acceleration due to gravity, $g = 9{\cdot}8\ \text{m s}^{-2}$) (18)

9. (*a*) What is meant by a thermometric property? (6)

Name the type of thermometer shown in Fig. 3. What is the thermometric property upon which it is based? (12)

Give an equation to define temperature on the Celsius scale for the thermometer shown in Fig. 3. What is 65°C on the Kelvin scale of temperature? (15)

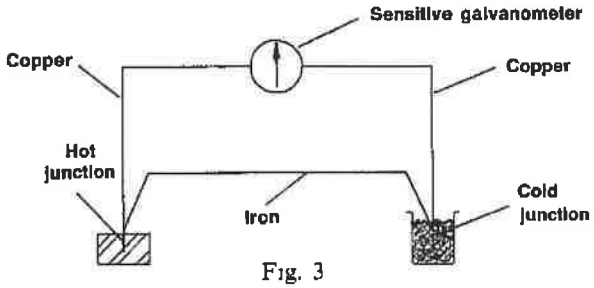

Fig. 3

(*b*) Define specific latent heat. (9)
Outline how you would measure *either* the specific latent heat of vaporisation of water *or* the specific latent heat of fusion of ice. (24)

10. State the laws of reflection of light. (12)

Explain what is meant by (i) a real image, (ii) a virtual image. (12)

Describe a laboratory experiment to measure the focal length of a concave mirror. (24)

An object is placed 15 cm in front of a concave mirror of focal length 10 cm. At what distance from the mirror will an image be formed? What is the nature and magnification of the image formed? (18)

11. Define (i) the volt, (ii) capacitance. (12)

State the factors upon which the capacitance of a parallel-plate capacitor depends. (18)

Outline a laboratory experiment to show how the capacitance depends on *one* of these factors. (21)

Calculate the charge on the capacitor in Fig. 4. (9)

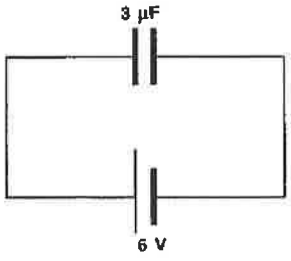

Fig. 4

Give a common use of capacitors. (6)

12. (*a*) What is meant by the resistivity of the material of a wire? (9)

Outline a laboratory experiment to measure the resistivity of the material of a wire. (24)

(*b*) How would you show that a current-carrying conductor experiences a force when it is placed in a magnetic field? (15)

Name an instrument, the operation of which is based on the above principle. (6)

Calculate the force acting on a conductor of length 20 cm which is carrying a current of 2 A and which is perpendicular to a magnetic field of magnetic flux density 0·5 tesla. (12)

13. Answer any *two* of the following.

(*a*) What is meant by the interference of light waves? (6)

Describe a laboratory experiment to measure the wavelength of monochromatic light. (27)

(*b*) State a factor upon which the quality of a musical note depends. (9)

Describe a laboratory experiment to measure the speed of sound in air. (24)

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

Sketch a graph to show the variation with time of the output current of an a.c. generator. (9)

Describe the function of (i) an induction coil, (ii) a transformer. (15)

(*d*) Explain the term photoelectric emission. (9)

The circuit in Fig. 5 may be used in an experiment to show the relationship between the intensity of the light and the photocurrent.

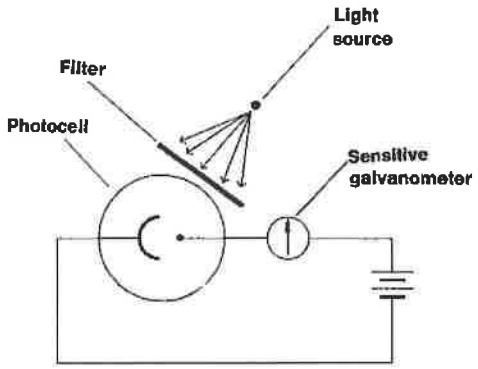

Fig. 5

(i) How would the intensity of the light be varied? (9)

(ii) Sketch a graph to show the effect on the photocurrent of changing the intensity of the light. (9)

Give one application of photoelectric emission. (6)