Write your Examination Number here

AN ROINN OIDEACHAIS

LEAVING CERTIFICATE EXAMINATION, 1989

PHYSICS — ORDINARY LEVEL

THURSDAY, 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) A person of mass 80 kg is running with a velocity of 5 m s^{-1} in a certain direction. The momentum of the person is

A. 200 kg m s^{-1}
B. 400 kg m s^{-1}
C. 1,000 kg m s^{-1}
D. 2,000 kg m s^{-1}
E. 4,000 kg m s^{-1}.

Answer ☐ (6)

(ii) Boyle's law states that for a fixed mass of gas

A. pressure is proportional to volume, if temperature is constant
B. pressure is inversely proportional to volume, if temperature is constant
C. pressure is proportional to the square of temperature, if volume is constant
D. pressure is inversely proportional to temperature, if volume is constant
E. pressure is proportional to the square of volume, if temperature is constant.

Answer ☐ (6)

(iii) Fig. 1 shows light passing through an optical fibre. Which of the following statements is *incorrect?*

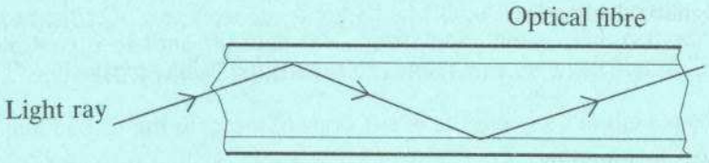

Fig. 1

A. Optical fibres are used in telecommunications.
B. The light passes through the optical fibre by total internal reflection.
C. An optical fibre is made of glass.
D. Optical fibres are used in medicine.
E. Optical fibres are used to transmit electrical energy.

Answer ☐ (6)

(iv) If $6{\cdot}60 \times 10^5$ J of energy is required to convert 2 kg of ice at 0 °C to water at 0 °C, what is the specific latent heat of fusion of ice?

A. $1{\cdot}32 \times 10^5$ J kg^{-1}
B. $3{\cdot}30 \times 10^5$ J kg^{-1}
C. $1{\cdot}32 \times 10^6$ J kg^{-1}
D. $3{\cdot}30 \times 10^6$ J kg^{-1}
E. $6{\cdot}60 \times 10^6$ J kg^{-1}.

Answer ☐ (6)

(v) The unit of capacitance is

A. the joule
B. the farad
C. the volt
D. the coulomb
E. the watt.

Answer ☐ (6)

(vi) The moving-coil galvanometer

A. is a device for converting direct current (d.c.) to alternating current (a.c.)
B. is used to generate an alternating current
C. is a device for converting a.c. to d.c.
D. may be used to measure very small currents
E. is used to vary resistance.

Answer ☐ (6)

2. Answer *five* of the following.

(i) Two primary colours are ..... and .....(6)

(ii) Ultraviolet light has a ..... wavelength than visible light and it causes .....
in some substances. (6)

(iii) An everyday use of a concave mirror is .....
.....(6)

(iv) Two factors upon which the capacitance of a parallel-plate capacitor depends are .....
..... and .....
.....(6)

(v) What is meant by magnetic declination? .....
.....(6)

(vi) The electric battery was invented by ..... towards the
end of the ..... century. (6)

AN ROINN OIDEACHAIS

LEAVING CERTIFICATE EXAMINATION, 1989

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. A student performed a laboratory experiment to verify the principle of conservation of momentum.

(i) Draw a labelled diagram of the apparatus which could be used in the experiment. (9)

(ii) State the measurements which the student would have made in the experiment. (12)

(iii) Indicate how the measurements made in this experiment could be used to verify the principle of conservation of momentum. (9)

(iv) State a precaution which should be taken in this experiment in order to ensure an accurate result. (9)

6. A student used the apparatus shown in Fig. 3 in an experiment to investigate the relationship between the frequency of vibration of a string and the length of the string, when the tension in the string was kept constant.

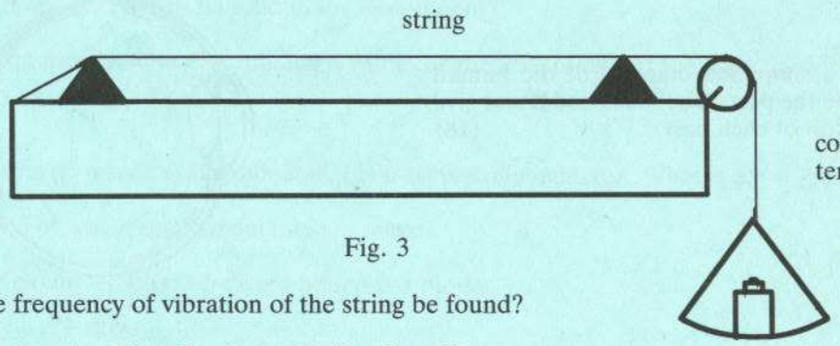

Fig. 3

(i) How may the frequency of vibration of the string be found? (9)

(ii) How may the length of the vibrating string be altered? (6)

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

Length, l (metres)	0·2	0·3	0·4	0·5	0·6	0·7	0·8
Frequency, f (hertz)	650	433	307	260	216	185	163

Draw a graph of f against $1/l$ on graph paper. Explain how this graph shows that f is proportional to $1/l$. (24)

7. The following is an extract from a student's report of an experiment to measure the electrochemical equivalent of copper.

"The copper cathode was cleaned, weighed and then put in the circuit. A constant current was passed for a suitable length of time through the copper voltameter. The cathode was then washed, dried and reweighed. The electrochemical equivalent of copper was then calculated."

(i) Draw a labelled circuit diagram to show the apparatus used in the experiment. (9)

(ii) How can the current be kept constant? (6)

(iii) What would be the effect of allowing too large a current to pass? (6)

(iv) Calculate the electrochemical equivalent of copper from the following measurements which were obtained in the experiment.

Initial mass of cathode = 35·34 g

Final mass of cathode = 35·82 g

Constant current = 0·75 A

Time = 30 minutes (18)

SECTION C (200 marks)

Answer **three** questions from this section.

Each question carries the same number of marks.

---

8. Define (i) energy, (ii) work. (12)

State the principle of conservation of energy. (6)

Give an example of

(i) the conversion of electrical energy to light energy,

(ii) the conversion of heat energy to kinetic energy. (12)

An object of mass 3 kg is dropped from a height of 20 metres above the ground. Taking the acceleration due to gravity, g, as 9·8 m s^{-2}, calculate

(i) the potential energy of the object before it is dropped, (9)

(ii) the kinetic energy of the object on striking the ground, (9)

(iii) the velocity with which the object strikes the ground. (12)

What happens to the kinetic energy of the object after it strikes the ground? (6)

9. (*a*) Define specific heat capacity. (9)

Describe a laboratory experiment to measure the specific heat capacity of a liquid *or* a metal. (24)

(*b*) What is meant by the term thermometric property? Give an example of a thermometric property. (12)

Describe an experiment to calibrate and use a thermometer. (21)

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

Outline a laboratory experiment to verify Snell's law of refraction. (18)

Fig. 4 is a simplified diagram of the human eye. Name the parts labelled **A** and **B** and give the function of each part. (18)

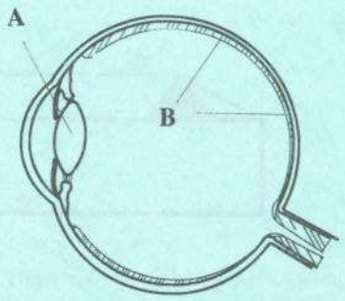

Fig. 4

Draw a ray diagram to show the formation of the final image of an object in an astronomical telescope. (18)

11. State Coulomb's law. (9)

Explain the terms (i) conductor, (ii) insulator, giving an example in each case. (12)

Outline an experiment to show the existence of forces between charged bodies. (15)

Fig. 5 shows a Van de Graaff generator. For what purpose is a Van de Graaff generator used? (6)

Name the parts labelled **A** and **B** in Fig. 5. Explain the principle upon which the Van de Graaff generator is based. (24)

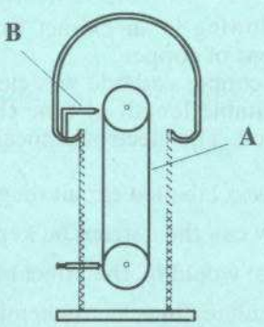

Fig. 5

12. (*a*) State Ohm's law. (9)

Outline a laboratory experiment to demonstrate Ohm's law. (15)

Calculate the current in the circuit in Fig. 6 when the voltmeter registers 9 V. (9)

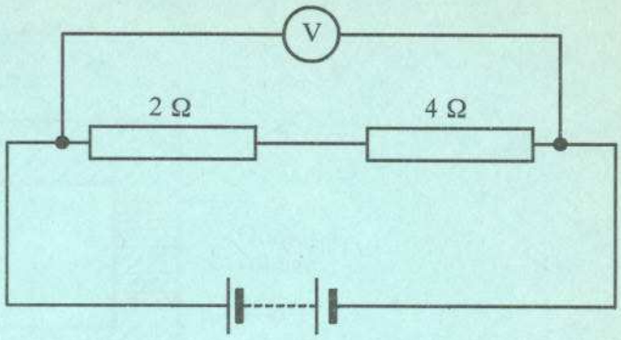

Fig. 6

(*b*) Describe an experiment to demonstrate the magnetic effect of an electric current. (12)

What is the function of an electromagnetic relay? Explain, with the aid of a diagram, the principle of operation of an electromagnetic relay. (21)

13. Answer any *two* of the following.

(*a*) Describe a laboratory experiment to measure the coefficient of dynamic friction. (21)

Give *two* examples from everyday life of how friction may be reduced. (12)

(*b*) A student used a diffraction grating in an experiment to measure the wavelength of monochromatic light. The student's report stated that on passing through the diffraction grating the light was diffracted and interference occurred.

(i) Explain the underlined terms in the above paragraph. (18)

(ii) What other apparatus may be used in the experiment? (6)

(iii) Give the equation used in determining a value for the wavelength of the light, in this experiment. (9)

(*c*) Explain the terms (i) p-type semiconductor, (ii) n-type semiconductor. What is a p-n junction? (18)

Name a material of which semiconductors are made. (6)

Draw a simple circuit to show a forward biased p-n diode. (9)

(*d*) Explain the terms (i) radioactivity, (ii) half-life. (12)

State *one* way in which radioactivity is (i) of benefit, (ii) harmful, to people. (12)

A radioactive isotope has a half-life of 3 years. What fraction of a sample of the isotope will remain after 9 years? (9)