WARNING: You must return this section with your answerbook, otherwise marks will be lost.

Write your Examination Number here

AN ROINN OIDEACHAIS

8772

LEAVING CERTIFICATE EXAMINATION, 1993

PHYSICS — ORDINARY LEVEL

THURSDAY, 17 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 Sections B and C.

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

(i) The acceleration produced by a force of 12 N acting on a 3 kg mass is

A. 0.25 m s^{-2}
B. 0.41 m s^{-2}
C. 4 m s^{-2}
D. 36 m s^{-2}
E. 39.2 m s^{-2}.

Answer ☐ (6)

(ii) A wine glass may be shattered by a person singing a high note. This is an example of

A. reflection
B. diffraction
C. resonance
D. polarisation
E. refraction.

Answer ☐ (6)

(iii) The farad is a unit of

A. potential difference
B. electromotive force
C. energy
D. capacitance
E. momentum.

Answer ☐ (6)

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

A. 3 Ω
B. 1.67 Ω
C. 12 Ω
D. 2.67 Ω
E. 7.33 Ω.

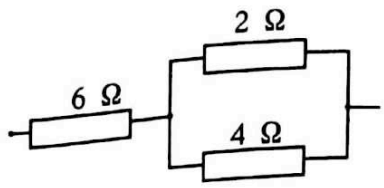

Fig. 1

Answer ☐ (6)

(v) An electron is

A. positively charged and orbits the nucleus
B. neutral and is in the nucleus
C. neutral and has a mass of 1 u
D. negatively charged and has a mass of 1 u
E. negatively charged and orbits the nucleus.

Answer ☐ (6)

(vi) Albert Einstein deduced the following equation

A. $E = \frac{1}{2}mv^2$
B. $E = mc^2$
C. $F = ma$
D. $E = mgh$
E. $E = hf$.

Answer ☐ (6)

2. Answer *five* of the following.

(i) Displacement is a vector quantity because it has a magnitude and a ..... (6)

(ii) The pressure in a fluid depends on the .....

and on the ..... of the fluid. (6)

(iii) Define limiting friction .....

.....

..... (6)

(iv) What are the two fixed points on the Celsius temperature scale? .....

..... (6)

(v) Optical fibres make use of ..... of light. (6)

(vi) X-rays are used in medicine to .....

..... (6)

3. Answer *five* of the following.

(i) The magnetic field pattern shown in Fig. 2 is produced by bringing two bar magnets close together. If pole X is a north pole, what is the polarity of pole Y?

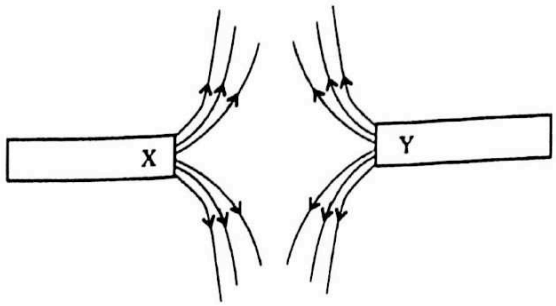

Fig. 2

..... (6)

(ii) The unit of magnetic flux density is.....

..... (6)

(iii) What is meant by the angle of dip? .....

.....

..... (6)

(iv) What is meant by magnetic declination? .....

.....

..... (6)

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

..... (6)

(vi) Name an instrument, the operation of which is based on the force on a current carrying conductor in a magnetic field..... (6)

4. The circuit in Fig. 3 is used to switch a relay on and off. Answer *five* of the following.

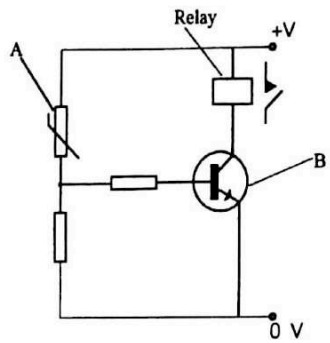

Fig. 3

(i) What is the function of a relay?.....

.....

.....

..... (6)

(ii) Name the device labelled A in Fig. 3..... (6)

(iii) What happens to A when it is heated?.....

..... (6)

(iv) What happens to the relay when A is heated? .....

..... (6)

(v) Name B in Fig. 3 ..... (6)

(vi) Give a possible use for the kind of switch shown in Fig. 3 .....

..... (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. In a laboratory experiment, the acceleration, a, of a body was measured for a series of values of the applied force, F.

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

(ii) Explain how the effect of friction may have been reduced. (6)

(iii) The following results were obtained in the experiment.

F/N	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
a/cm s^{-2}	8.4	17.6	25.4	35.0	43.9	51.5	60.4	70.0

Plot a graph on graph paper of acceleration against force. What conclusion may be drawn from the graph? (24)

6. A student performed a laboratory experiment to measure the speed of sound in air.

(i) Draw a labelled diagram showing the apparatus which the student could have used in the experiment. (9)

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

(iii) Explain how these measurements would be used to calculate a value for the speed of sound in air. (9)

(iv) Indicate the steps which should be taken to ensure an accurate result in this experiment. (9)

7. In an experiment to determine the resistivity of nichrome, a student measured the length, diameter and the resistance of a sample of nichrome wire. The following values were obtained,

length = 89.2 cm (8.92×10^{-1} m),
diameter = 0.22 mm (2.2×10^{-4} m),
resistance = 28.2 ohm.

(i) State how the resistance of the nichrome wire could have been determined. (9)

(ii) Name the instrument used to measure accurately the diameter of the nichrome wire. (6)

(iii) State a precaution which should be taken when determining the length of the wire in order to ensure an accurate result. (6)

(iv) Calculate the resistivity of nichrome, using the data given above. (18)

SECTION C (200 marks)

Answer **three** questions from this section.

Each question carries the same number of marks.

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8. Define momentum. (6)

State the principle of conservation of momentum. (9)

Give an application from everyday life of the conservation of momentum. (6)

Describe a laboratory experiment to verify the principle of conservation of momentum. (30)

An object of mass 3 kg which is travelling with a velocity of 10 m s^{-1} in a certain direction collides with another object of mass 6 kg which is travelling with a velocity of 2 m s^{-1} in the opposite direction. If the two objects join together calculate the velocity of the combined mass after the collision.

Calculate the change in kinetic energy of the 3 kg object. (15)

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

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

(b) What is meant by the conduction of heat? (6)

Outline a laboratory experiment to compare the rates of heat conduction through a number of different solids. (15)

What information is given by the U-value of a structure? How may the U-value be reduced? (12)

10. Draw a ray diagram to show the formation of (i) a real image, (ii) a virtual image, by a converging lens. (18)

Describe a laboratory experiment to measure the focal length of a converging lens. (27)

An object 4 cm high is placed vertically on the principal axis 30 cm from a converging lens of focal length 20 cm. Calculate (i) the position, (ii) the height, of the image. (15)

Name an optical instrument which makes use of a converging lens. (6)

11. State *one* of the laws of electromagnetic induction. (9)

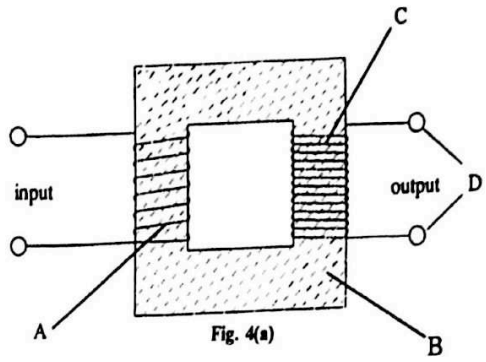

Fig. 4(a)

Fig. 4 (a), (b) and (c) show three devices. The operation of each device is based on the laws of electromagnetic induction.

Name each of the three devices. State, in each case, the purpose for which it is used. (30)

In the case of *one* of the devices,

(i) name the parts labelled A,B and C; (18)

(ii) state what happens at D. (9)

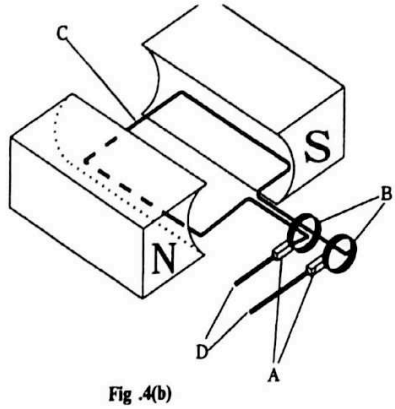

Fig .4(b)

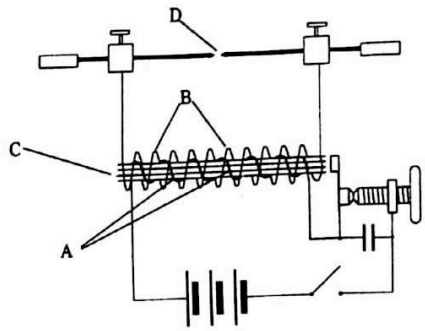

Fig. 4(c)

12. Name the three types of radiation which may be emitted from a radioactive source. (9)

Of the three types of radiation, which one is

(i) the most penetrating,

(ii) the most strongly ionising,

(iii) undeviated in a magnetic field. (18)

How would you show in the laboratory that the three radiations have different ranges in air? (12)

Name one type of nuclear radiation detector and outline its principle of operation. (15)

One-sixteenth of a sample of a certain radioactive isotope remains after 4 years. Calculate the half-life of the radioactive isotope. (12)

13. Answer any *two* of the following.

(a) State Newton's Universal Law of Gravitation. (9)

What is meant by the term acceleration due to gravity? (6)

Give an expression for the relationship between g, the acceleration due to gravity and G, the universal gravitational constant. (6)

Define weight. (6)

An object of mass 5 kg has a weight of 8.2 N when on the surface of the Moon. Calculate the acceleration due to gravity on the surface of the Moon. (6)

(b) Give an example of (i) a transverse wave motion, (ii) a longitudinal wave motion. (6)

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

Describe how you would use Young's slits to demonstrate the wave nature of light. (21)

(c) State *two* means by which an object may become charged. (6)

Describe an experiment to show that two bodies with like charges will repel each other? (12)

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

Outline the basic principle upon which the Van de Graaff generator is based. (9)

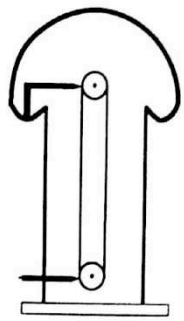

Fig. 5

(d) State Faraday's first law of electrolysis. Give an industrial application of electrolysis. (15)

Calculate the mass of copper deposited in a copper voltameter when a current of 0.5 A passes for a time of one hour. (18)

(Electrochemical equivalent of copper = 3.3×10^{-7} kg C^{-1})