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 1994

PHYSICS — ORDINARY LEVEL

THURSDAY, 16 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 items, (i), (ii), (iii) etc. In the case of each item write the letter corresponding to the correct answer in the box provided.

(i) The average acceleration of a car which changes its velocity from rest to 30 m s^{-1} in a time of 10 seconds is

A. 3 m s^{-2}
B. 20 m s^{-2}
C. 30 m s^{-2}
D. 40 m s^{-2}
E. 300 m s^{-2}.

Answer ☐ (6)

(ii) Which of the following *is not* a form of energy?

A. light
B. sound
C. momentum
D. electricity
E. heat.

Answer ☐ (6)

(iii) To verify Boyle's law, a straight line graph may be drawn of

A. pressure against volume
B. 1/pressure against 1/volume
C. pressure against 1/volume
D. pressure against $(\text{volume})^2$
E. pressure against temperature.

Answer ☐ (6)

(iv) Which of the following statements is *not* correct?

A. The force between electric charges was investigated by Charles Coulomb.
B. The magnetic effect of an electric current was discovered by Michael Faraday.
C. The relationship between electric current and heat produced in a resistor was established by James Joule.
D. X-rays were discovered by Wilhelm Röntgen.
E. Radioactivity was discovered by Henri Becquerel.

Answer ☐ (6)

(v) An electromagnetic relay is based on the principle that

A. a current in a magnetic field experiences a force
B. a changing current in a solenoid produces a force
C. a changing current in a solenoid induces an e.m.f.
D. a current in a solenoid produces a magnetic field
E. a current in a magnetic field induces an e.m.f.

Answer ☐ (6)

(vi) The decay constant for a particular radioactive isotope is $9.8 \times 10^{-3}\ s^{-1}$. The half-life of the isotope is

A. 6.8×10^{-3} s
B. 3.3×10^{-2} s
C. 1.4×10^{-2} s
D. 31 s
E. 71 s.

Answer ☐ (6)

2. Answer *five* of the following.

(i) State the principle of moments. .....

.....

..... (6)

(ii) Give two assumptions of the kinetic theory of gases. .....

.....

..... (6)

(iii) A diffraction grating is placed at a fixed distance from a screen. When monochromatic light is passed through the diffraction grating the position of a first order image produced on the screen is determined by the .....and the

..... (6)

(iv) The angle of declination is the angle between the .....

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

(v) Give two uses of electrolysis. .....

..... (6)

(vi) Given that the charge on the electron is 1.60×10^{-19} C and the charge to mass ratio for the electron is 1.76×10^{11} C kg^{-1} calculate the mass of the electron. .....

..... (6)

3. Answer *five* of the following.

(i) Give a property which is common to all the types of radiation which make up the electromagnetic spectrum

.....(6)

(ii) Which of the following have the shortest wavelength:

radio waves, microwaves, ultra violet waves?

.....(6)

(iii) How may infra-red radiation be detected?

.....

.....(6)

(iv) Give one type of emission spectrum.

.....(6)

(v) State two means by which white light may be dispersed.

(a) .....

(b) .....(6)

(vi) What German physicist gave his name to the dark lines observed in the sun's spectrum?

.....(6)

OVER➡

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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.

5. In an experiment to measure the specific latent heat of fusion of ice, a student wrote the following.

"The ice was suitably prepared and when the measurements had been made it was added to water which was contained in a copper calorimeter. When all the ice had melted more measurements were made. From these measurements the specific latent heat of fusion of ice was calculated".

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

(ii) How might the ice have been suitably prepared before it was added to the water? (6)

(iii) What measurements should be taken before adding the ice to the water? (9)

(iv) What measurements should be taken after adding the ice to the water? (9)

(v) Give a precaution to ensure an accurate result in this experiment. (6)

6. The following is part of a report given by a student of an experiment to measure the speed of sound in air.

"The distances were measured and from them a value for the wavelength of the sound was obtained. The frequency was noted and the speed of sound in air was then calculated".

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

(ii) State, with the aid of the diagram, the measurements which would have been made by the student in this experiment. (9)

(iii) How might the wavelength of the sound have been obtained from these measurements? (6)

(iv) How might the speed of sound in air have been calculated? (9)

(v) What steps would you take to ensure an accurate result in this experiment? (6)

7. The apparatus shown in Fig. 3 was used in an experiment to investigate the variation of the resistance of a length of copper wire, with temperature.

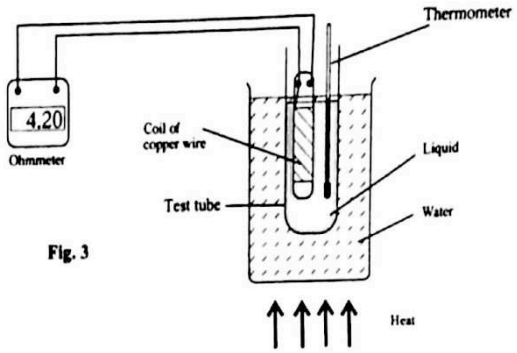

Fig. 3

The following table shows how the resistance of the wire varied with temperature.

Temperature/°C	12	22	32	42	52	62	72	82
Resistance/Ω	3.8	4.1	4.4	4.8	5.0	5.3	5.7	6.0

(i) Use the above data to draw a graph, on graph paper, of resistance against temperature. (21)

(ii) Use the graph to estimate the resistance of the wire at 20 °C. (6)

(iii) Estimate from the graph the temperature of the copper wire being heated in Fig. 3. (6)

(iv) Name a liquid which would be suitable for use in the test tube in Fig. 3. (6)

SECTION C (200 marks)

Answer **three** questions from this section.

Each question carries the same number of marks.

8. (a) State the principle of moments. (9)

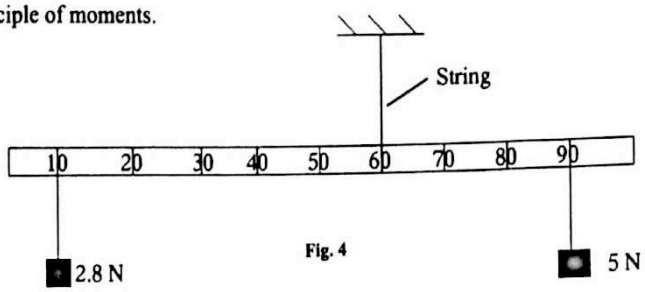

Fig. 4

Fig. 4 shows a uniform metre stick of mass 0.1 kg which is in equilibrium under the action of a number of forces. Calculate the weight of the metre stick. Use the information given in the diagram to explain how this arrangement may be said to verify the principle of moments.(Take $g = 9.8$ m s^{-2}) (24)

(b) What is meant by limiting friction? (6)

Outline a laboratory experiment to demonstrate limiting friction. (12)

A block of mass 5 kg rests on a rough horizontal surface and is acted upon by a horizontal force of 12 N. The block is on the point of moving. Draw a simple diagram to indicate the directions of the forces acting on the block. Calculate the coefficient of static friction between the block and the surface. (Take $g = 9.8$ m s^{-2}) (15)

9. (a) Explain with the aid of a diagram the terms

(i) critical angle, (ii) total internal reflection. (18)

Give a practical application of total internal reflection. (6)

The critical angle for a certain liquid is 46° 30′. Calculate the refractive index of the liquid. (9)

(b) Describe a laboratory experiment to measure the focal length of a concave mirror. (18)

Find the position and the magnification of the image formed by a concave mirror of focal length 15 cm when an object is placed 45 cm from the mirror. (15)

(9)

10. (a) Define the volt.

Calculate the work done in transferring a charge of 6 C between two points when the potential difference between the points is 4 V. (9)

Name the apparatus shown in Fig. 5.

What are the parts labelled A and B in Fig. 5. (9)

What is the function of the part labelled C? (6)

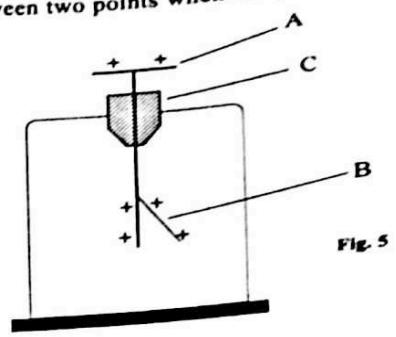

Fig. 5

(6)

(b) Define capacitance. (9)

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

Outline an experiment to demonstrate how the capacitance depends on any one of these factors.

(9)

11. (a) State the principle on which the operation of a moving coil galvanometer depends. (18)

Describe an experiment to illustrate this principle. (6)

How may a moving coil galvanometer be converted to function as an ammeter? (9)

(b) What is meant by electromagnetic induction ? (15)

Outline an experiment to demonstrate electromagnetic induction.

A transformer has 400 turns of wire in the primary coil and 100 turns in the secondary coil. Calculate the voltage in the secondary coil if the primary coil is connected to an a.c. power supply of 220 V? (9)

(6)

12. (a) State two properties of electrons.

Outline, with the aid of a labelled diagram in each case,

(i) the production of a beam of electrons in a cathode ray tube; (27)

(ii) how X-rays are produced in an X-ray tube.

(b) Fig. 6 shows three semiconductor devices.

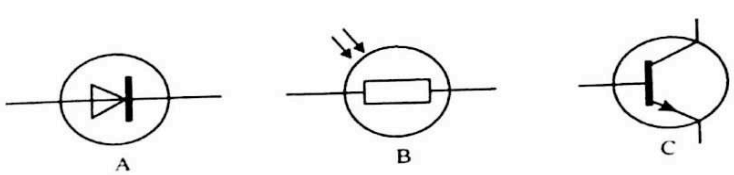

Fig. 6

(i) Name the devices labelled A, B, C. (9)

(ii) Give an application of each device. (9)

(iii) Draw a simple circuit containing any one of the devices A, B, C.
Explain the function of the device you have chosen in the operation of this circuit. (15)

13. Answer any **two** of the following. (12)

(a) Define (i) work, (ii) power. (21)

A crane lifts a mass of 500 kg through a vertical height of 12 m in 10 seconds. Calculate (i) the work done, (ii) the average power developed.

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

(12)

(b) What is meant by a thermometric property? Give two examples of thermometric properties. (21)

Describe a laboratory experiment to calibrate and use a thermometer.

(c) Fig. 7 shows an electromagnetic relay.

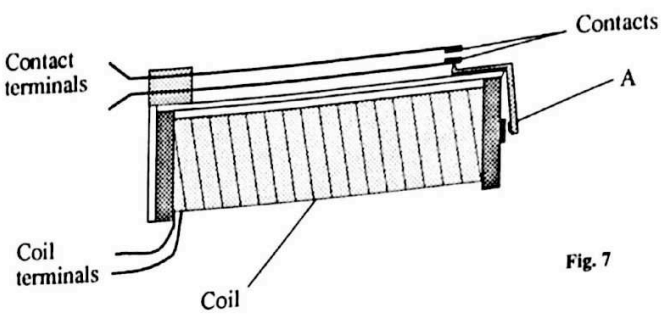

Fig. 7

(i) What is the function of an electromagnetic relay? (9)

(ii) Explain why the contacts close when a current is passed through the coil of the electromagnetic relay. (12)

(iii) State the function of the part labelled A. (6)

(iv) Give an everyday use of the electromagnetic relay. (6)

(d) $^{25}_{11}Na$ is an isotope of sodium. It is radioactive and has a half-life of one minute. (18)

Explain the underlined terms.

(9)

What fraction of a sample of $^{25}_{11}Na$ remains after 3 minutes?

(6)

Mention two uses of radioactive isotopes.