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Write your Examination Number here

AN ROINN OIDEACHAIS

LEAVING CERTIFICATE EXAMINATION, 1987

PHYSICS — ORDINARY LEVEL

MONDAY, 22 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) The unit of energy is

A. the watt (W)
B. the joule (J)
C. the kelvin (K)
D. the pascal (Pa)
E. the farad (F).

Answer ☐ (6)

(ii) Fig. 1 shows an object of mass 2 kg resting on a rough surface. A force of 5 N is just sufficient to cause the object to move. If $g = 10 \text{ m s}^{-2}$ the coefficient of friction is

A. 4·0
B. 0·4
C. 0·25
D. 2·5
E. 1·0.

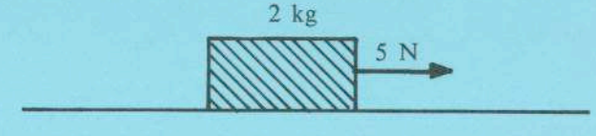

Fig. 1.

Answer ☐ (6)

(iii) Which of the following statements is *not* true with regard to sound?

A. The speed of sound is a constant.
B. Interference occurs in sound.
C. The pitch of a note depends on its frequency.
D. Sound requires a medium.
E. The human ear is sensitive to a particular range of frequencies.

Answer ☐ (6)

(iv) Which of the following has the *shortest* wavelength?

A. Radio waves
B. Gamma rays
C. Visible light
D. Infra-red rays
E. Microwaves.

Answer ☐ (6)

(v) To convert a galvanometer into an ammeter

A. a low resistance is connected in parallel
B. a low resistance is connected in series
C. the terminals are shorted
D. a high resistance is connected in series
E. a high resistance is connected in parallel.

Answer ☐ (6)

(vi) Alpha particles are

A. strongly ionising and they penetrate far in air
B. weakly ionising and they penetrate far in air
C. not affected by magnetic and electric fields
D. weakly ionising and they do not penetrate far in air
E. strongly ionising and they do not penetrate far in air.

Answer ☐ (6)

2. Answer *five* of the following.

(i) Give an application of optical fibres.....

.....(6)

(ii) The boiling of water in an electric kettle is an example of the conversion of.....

energy to.....energy. (6)

(iii) Additional insulation will ..... the U-value of a structure. (6)

(iv) A pair of complementary colours are ..... and ..... (6)

(v) State Coulomb's law of force between electric charges.....

.....

.....(6)

(vi) What are isotopes?.....

.....(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. The following is an account of an experiment to measure the specific latent heat of fusion of ice.

"Crushed ice cubes were added to water which was slightly warmer than room temperature, and contained in a well lagged calorimeter. The temperature of the water was measured before and after the addition of the ice. The mass of the calorimeter and contents was also determined."

The following measurements were obtained.

Mass of calorimeter	= 60 g
Mass of calorimeter + warm water	= 175 g
Mass of calorimeter + contents after addition of ice	= 195 g
Temperature of warm water	= 26·5 °C
Temperature of ice	= 0 °C
Temperature of calorimeter and contents after addition of ice	= 12·7 °C

Given that the specific heat capacity of water is 4,200 J $kg^{-1} K^{-1}$ and that the specific heat capacity of the material of the calorimeter is 390 J $kg^{-1} K^{-1}$, use the measurements given above to

(i) find (*a*) the heat lost by the calorimeter, (*b*) the heat lost by the warm water, (12)

(ii) calculate the specific latent heat of fusion of ice. (15)

What was the reason for using crushed ice? (6)

State a possible source of error in this experiment. (6)

6. The following is part of a report given by a student of an experiment to verify Snell's law.

"The glass block was placed on a sheet of paper. The incident ray and the refracted ray were marked on the paper. Two angles were measured. The experiment was repeated for a number of other incident and refracted rays. The measurements were then tabulated."

(i) Describe how the incident and refracted rays could have been obtained in this experiment. (12)

(ii) Show by means of a diagram the angles which were measured. (12)

(iii) Indicate the additional steps that should be taken in order to verify Snell's law. (15)

7. In a laboratory experiment the velocity of an object was measured at various times and the following table was drawn up.

Velocity/m s^{-1}	0·42	0·79	1·16	1·53	1·90	2·27	2·64
Time/s	0	1·5	3·0	4·5	6·0	7·5	9·0

(i) List the apparatus which might have been used in the experiment. (9)

(ii) Draw a graph, using the above data, showing how the velocity of the object varied with the time. (18)

(iii) Use the graph to calculate the acceleration of the body. (12)

SECTION C (200 marks)

Answer **three** questions from this section.
Each question carries the same number of marks.

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8. Describe a laboratory experiment to measure g, the acceleration due to gravity. (33)

Give a precaution that should be taken in the experiment in order to improve the accuracy of the result. (9)

An object falls from a certain height and strikes the ground after 4 seconds. Calculate (i) the initial height of the object, (ii) the velocity of the object on striking the ground. (Take $g = 9{\cdot}8\ \text{m s}^{-2}$) (24)

9. (*a*) Define pressure. (9)

A tank contains 100 kg of water. If the area of the base of the tank is $0{\cdot}5\ \text{m}^2$ calculate the pressure of the water at the bottom of the tank. (Take $g = 9{\cdot}8\ \text{m s}^{-2}$.) (21)

(*b*) State Boyle's law. (9)

Describe a laboratory experiment to verify Boyle's law. (27)

10. (*a*) Describe, with the aid of a labelled diagram in each case,

(i) how a converging lens forms a magnified image of an object, (12)

(ii) how an image of an object is produced on the retina of the eye. (15)

(*b*) What is meant by the dispersion of light? (9)

State *two* methods for demonstrating the dispersion of light. In the case of *one* of these methods explain, with the aid of a diagram, how the dispersion takes place. (30)

11. State Ohm's law. (9)

What are the factors upon which the resistance of a metallic conductor depends? Outline an experiment to demonstrate how the resistance depends on any *one* of these factors. (33)

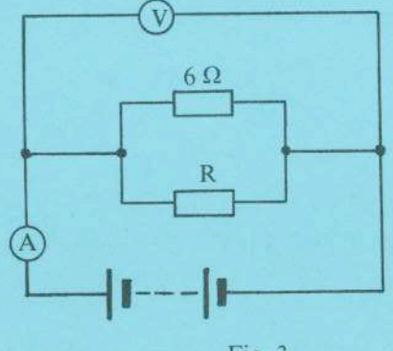

Fig. 3.

In the circuit shown in Fig. 3, when the voltmeter registers 4 V the ammeter registers 2 A. Calculate (i) the total resistance in the circuit, (ii) the resistance of the resistor R. (24)

12. Describe how a beam of electrons may be produced using a cathode ray tube and state *two* ways in which the beam may be deflected. (33)

Explain how a beam of electrons may be used in the production of X-rays. (21)

Give *two* precautions which should be taken in the use of X-rays. (12)

13. Answer any *two* of the following.

(*a*) In an experiment to verify Archimedes' principle an object of weight 6·5 N was suspended in water from a spring balance. The displaced water was collected in a beaker as shown in the photograph (Fig. 4). An enlarged photograph of the reading on the spring balance is also given in Fig. 4. If the mass of the empty beaker was 97·95 g, calculate

(i) the mass of water displaced, (6)

(ii) the weight of water displaced ($g = 9{\cdot}8\ \text{m s}^{-2}$), (6)

(iii) the upthrust on the object in the water. (9)

Explain how these results verify Archimedes' principle. (12)

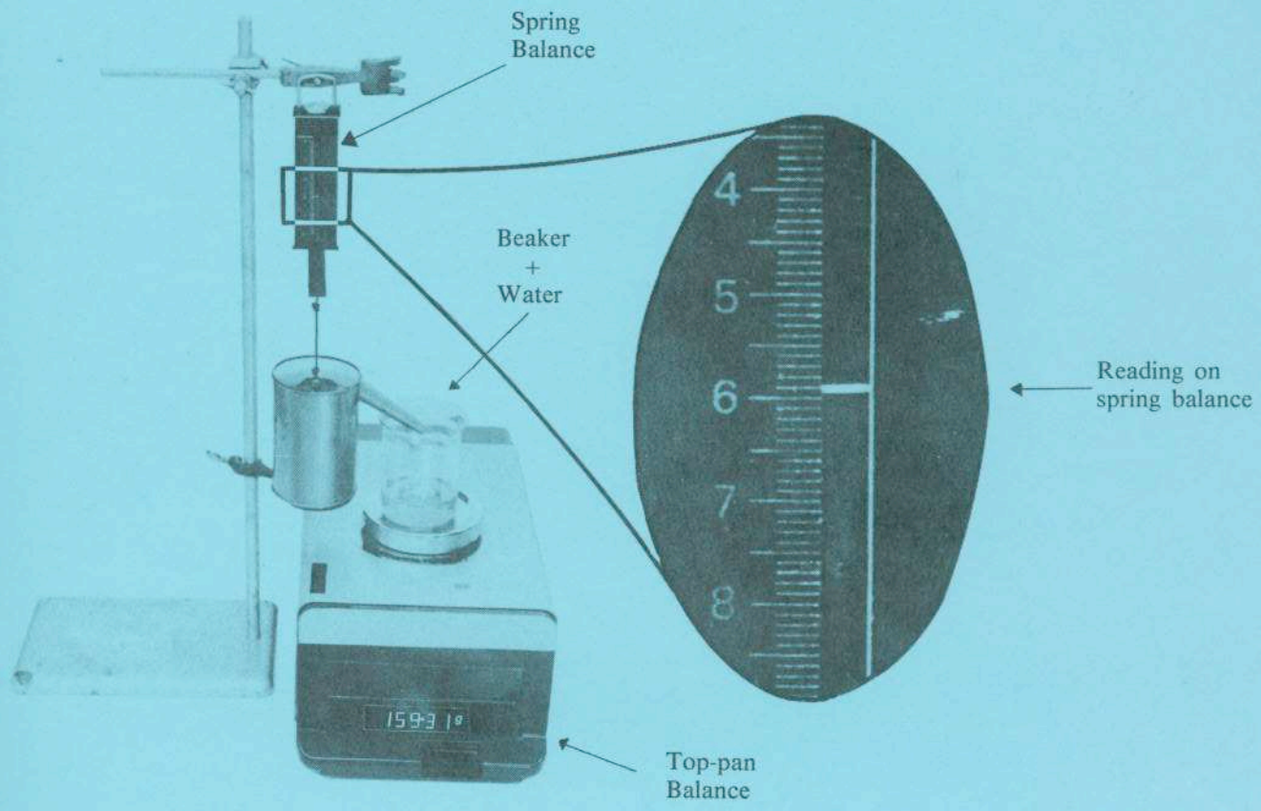

Fig. 4

(*b*) What is meant by a thermometric property? Give *two* examples. (12)

Describe a laboratory experiment to calibrate a thermometer. (21)

(*c*) Explain the terms (i) conductor (ii) insulator. (6)

Draw a labelled diagram of a Van de Graaff generator and explain the principle on which it is based. (21)

For what purpose is a Van de Graaff generator used? (6)

(*d*) Name *two* eminent scientists who have played a major role in the field of nuclear physics. (12)

What is meant by (i) nuclear fission, (ii) mass-energy conservation? (12)

In a nuclear reaction the difference in mass between the reactants and the products is $8{\cdot}63 \times 10^{-30}$ kg. Calculate the energy liberated in this reaction. (Speed of light, $c = 3 \times 10^{8}\ \text{m s}^{-1}$.) (9)

3. Fig. 2 shows a simple d.c. motor.

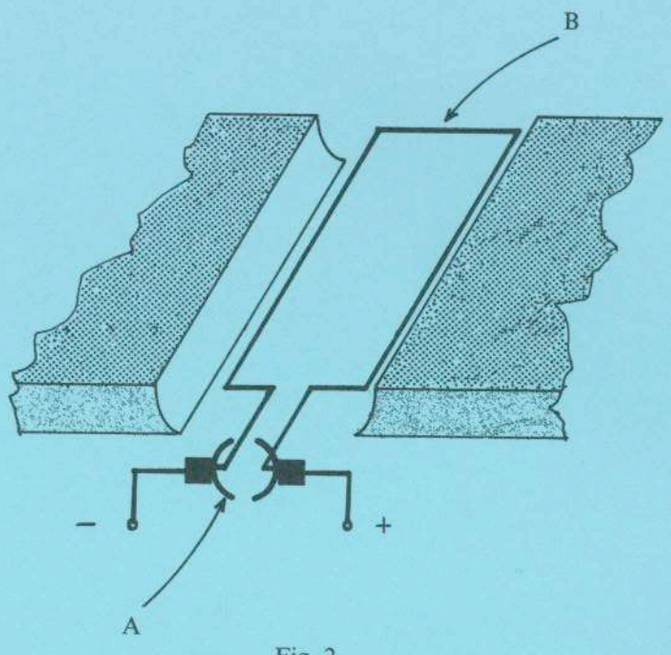

Fig. 2.

Answer *five* of the following.

(i) Identify the part A. ..... (6)

(ii) What is the function of A? .....

..... (6)

(iii) What happens to the coil B when the circuit is switched on? .....

..... (6)

(iv) Why is the coil B usually wound on an iron core? .....

.....

..... (6)

(v) Name an appliance which uses an electric motor. ..... (6)

(vi) Name another instrument which operates on the same principle as the electric motor. .....

..... (6)

4. Answer *five* of the following.

(i) What is a semiconductor? .....

..... (6)

(ii) An intrinsic semiconductor can be made into an extrinsic semiconductor by .....

..... (6)

(iii) In what way does light affect semiconductors? .....

..... (6)

(iv) What is a p-n junction? .....

..... (6)

(v) When will current flow across a p-n junction? .....

..... (6)

(vi) State one use of a p-n junction .....

..... (6)