UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

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PHYSICS **0625/33**

Paper 3 Extended **May/June 2011**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1 kg to be 10 N (i.e. acceleration of free fall = 10 m/s^2).

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **16** printed pages.

1 **(a)** Complete the table below to identify the physical quantities as scalars or vectors.

physical quantity	scalar or vector
speed	
velocity	
distance	
force	
kinetic energy	

[3]

(b) Fig. 1.1 shows the path of a football as it is kicked along the ground between three players. The distances between the players are shown on Fig. 1.1.

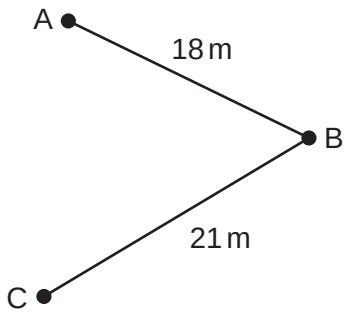

Fig. 1.1

The ball takes 1.2 s to travel from player A to player B.

(i) Calculate the average speed of the ball between A and B.

average speed = ...[2]

(ii) Player B kicks the ball to player C.
It travels with the same average speed.
Calculate the time taken for the ball to travel from B to C.

time = ...[2]

(iii) Suggest why the speed of the ball might change during its motion from A to

.....

.....[1]

(iv) Discuss whether the average velocities, from A to B and from B to C, are the same.

.....

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.....[1]

[Total: 9]

2 Fig. 2.1 shows a conveyor belt transporting a package to a raised platform. The belt is driven by a motor.

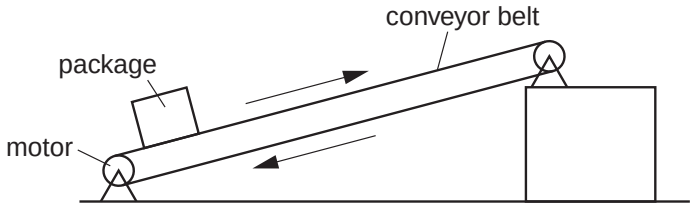

Fig. 2.1

(a) State **three** types of energy, other than gravitational potential energy, into which the electrical energy supplied to the motor is converted.

1. .....

2. .....

3. .....[2]

(b) The mass of the package is 36 kg. Calculate the increase in the gravitational potential energy (p.e.) of the package when it is raised through a vertical height of 2.4 m.

increase in p.e. = ...[2]

(c) The package is raised through the vertical height of 2.4 m in 4.4 s. Calculate the power needed to raise the package.

power = ... [2]

(d) Assume that the power available to raise packages is constant. A package of mass greater than 36 kg is raised through the same height. Suggest and explain the effect of this increase in mass on the operation of the belt.

.....

.....

.....

.....

.....[3]

[Total: 9]

3 **(a)** Complete the following statement:

The moment of a force about a point is .....

multiplied by .....[1]

(b) Fig. 3.1 shows a uniform iron bar B of weight 30 N and length 1.40 m. The bar is being used to lift one edge of a concrete slab S. A stone, placed 0.20 m from one end of B, acts as a pivot. A force of 40 N pushing down at the other end of B is just enough to lift the slab and hold it as shown.

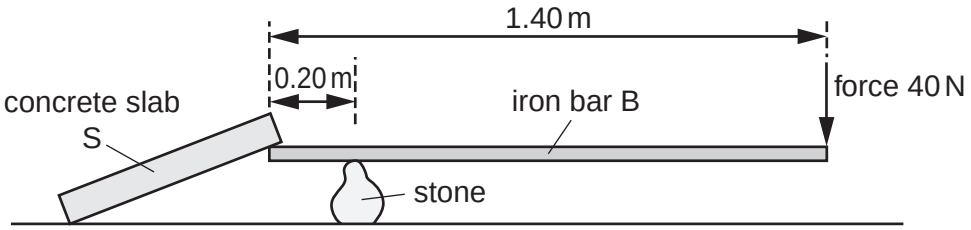

Fig. 3.1

(i) On Fig. 3.1, draw an arrow to show the weight of bar B acting from its centre of mass. [1]

(ii) State the distance *d* of the centre of mass of bar B from the pivot.

d = ...[1]

(iii) Calculate the total clockwise moment, about the pivot, of the forces acting on bar B.

total clockwise moment = ...[3]

(iv) Calculate the downward force which the slab S exerts on the end of bar B.

force = ...[2]

(v) Suggest a change to the arrangement in Fig. 3.1 that would reduce the force required to lift the slab.

.....

.....[1]

[Total: 9]

4 Use the information in the table when answering this question.

specific heat capacity of ice	2.0 J/(g °C)
specific heat capacity of water	4.2 J/(g °C)
specific latent heat of fusion of ice	330 J/g
specific latent heat of vaporisation of water	2260 J/g

(a) Explain what is meant by the statement: 'the specific latent heat of fusion of ice is 330 J/g'.

.....

.....

.....[1]

(b) A block of ice is taken from a freezer at –25 °C, placed in a metal container, and heated by a source of constant power.

The graph in Fig. 4.1 shows how the temperature of the contents of the container changes with time. At point E on the graph the container is empty.

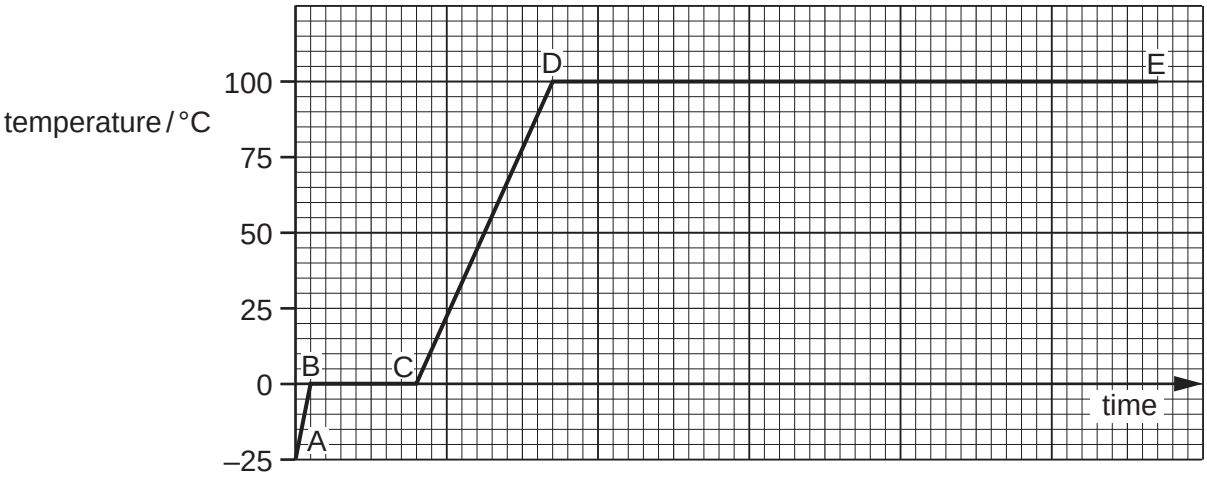

Fig. 4.1

(i) State what is taking place in the regions of the graph from B to C, and from D to E.

B to C .....

.....

D to E .....

.....[2]

(ii) Use the information in the table to explain why the line DE is longer than the line BC.

.....

.....

[1]

(iii) Use the information in the table to explain why the graph is steeper from A to B than from C to D.

.....

.....

.....[2]

[Total: 6]

5 Fig. 5.1 shows a gas contained in a cylinder enclosed by a piston.

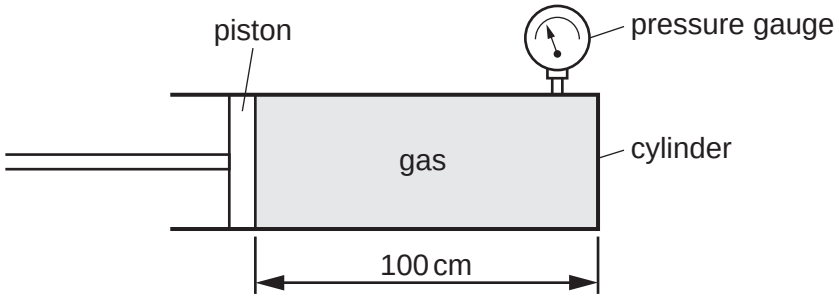

Fig. 5.1

At first, the length of cylinder containing the gas is 100 cm. The pressure of the gas, shown by the pressure gauge, is 300 kPa. The area of cross-section of the cylinder is 0.12 m^2.

(a) (i) Describe the motion of the molecules of the gas.

.....

.....

.....[1]

(ii) Explain how the molecules exert a force on the walls of the cylinder.

.....

.....[1]

(iii) Calculate the force exerted by the gas on the piston.

force = ...[2]

(b) The piston is moved so that the new length of cylinder occupied by the gas is 50 cm. The temperature of the gas is unchanged.

(i) Calculate the new pressure of the gas.

pressure = ...[2]

(ii) Explain, in terms of the behaviour of the molecules, why the pressure has c

.....

.....

.....[1]

[Total: 7]

6 **(a)** **(i)** A long rope, fixed at one end, is being used by a student to demonstrate waves.
State what the student does to the rope to produce the transverse wave.

.....

.....[1]

(ii) Fig. 6.1 shows a section of the rope when the transverse wave is present.

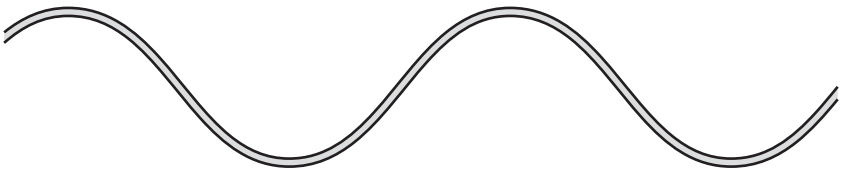

Fig. 6.1

On Fig. 6.1, show

1. a distance, labelled λ, corresponding to the wavelength of the wave,

2. a distance, labelled *A*, corresponding to the amplitude of the wave. [2]

(iii) Suggest what the student could do to reduce the wavelength of the wave.

.....

.....[1]

(b) The diagram in Fig. 6.2 represents waves on the surface of water in a ripple tank. The waves are travelling from deep water across a boundary into shallow water.

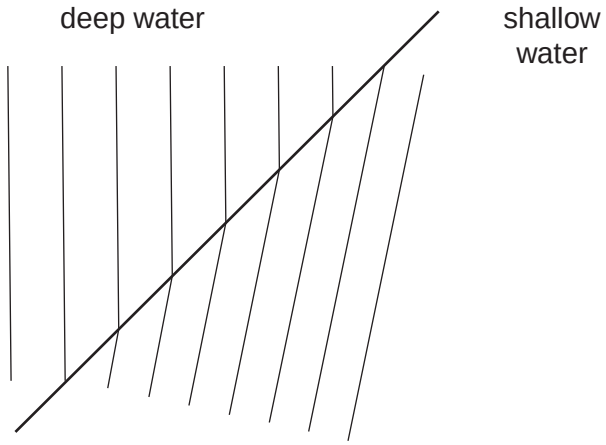

Fig. 6.2

Explain how the diagram shows that water waves travel more slowly in shallow water than in deep water.

.....

.....

.....

..... [3]

[Total: 7]

7 **(a)** What is meant by the *focal length* of a converging lens?

.....

.....[1]

(b) An object is placed in front of a converging lens. A real image is formed, as shown in Fig. 7.1. The converging lens is not shown.

Fig. 7.1

(i) Explain what is meant by a *real image*.

.....[1]

(ii) Rays of light from point A on the object form point B on the image.

On Fig. 6.1, draw

1. a ray to find the position of the converging lens, showing the lens as a vertical straight line in this position,

2. a ray to find the position of a principal focus of the lens, marking this position **F**,

3. a third possible ray from A to B. [3]

(iii) The distance between the object and the lens is increased. State any changes which take place in

1. the distance of the image from the lens,

.....

2. the size of the image.

.....[2]

[Total: 7]

8 **(a)** What is meant by the *electromotive force* (e.m.f.) of an electric power supply?

.....

.....[2]

(b) When connected to a 240V supply, a desk lamp has a power rating of 60W.

Calculate

(i) the current in the lamp,

current = ...[2]

(ii) the resistance of the lamp's filament.

resistance = ...[2]

(c) A torch lamp is normally connected to a 3.0V battery and carries a current of 0.25A. The resistance of its filament is 12Ω.

The desk lamp in **(b)** and the torch lamp are connected in series.

Students X and Y plan to connect the lamp combination to a 240V supply.

Student X says that the filament of the torch lamp will melt and the circuit will no longer work.
Student Y says that both lamps will light up and stay on.

Show, with a suitable calculation, whether student X or student Y is correct.

.....

.....[2]

[Total: 8]

9 **(a)** Fig. 9.1 shows a wire, held between the poles of a magnet, carrying a current in the direction of the arrow.

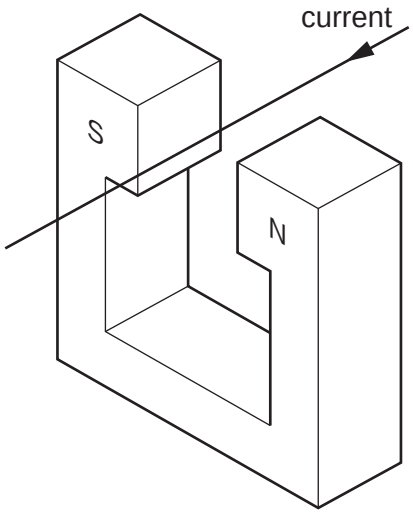

Fig. 9.1

(i) On Fig. 9.1, draw an arrow, labelled *F*, to show the direction of the force acting on the wire. [1]

(ii) Explain why the force *F* acts on the wire.

.....

.....[1]

(iii) The directions of the current and the magnetic field are both reversed. State the effect on the force *F*.

..... [1]

(b) Fig. 9.2 shows a negatively charged particle travelling, in a vacuum, into a region where a magnetic field acts. The magnetic field, shown by the crosses, is acting **into** the paper.

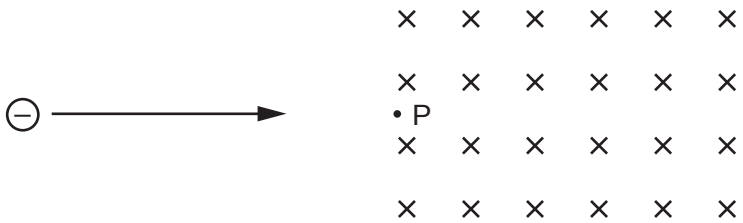

Fig. 9.2

(i) Draw an arrow, labelled *F*, to show the direction of the force on the particle at point P where it enters the field.

(ii) Describe the path of the particle as it continues to move through the magnetic field.

.....[2]

[Total: 5]

10 **(a)** In the space below, draw the symbol for an OR gate.

[1]

(b) Describe the action of an OR gate in terms of its inputs and outputs.

.....

.....

.....

.....

.....[2]

(c) A car manufacturer wishes to install an alarm system in a 2-door car to inform the driver if either door is not properly closed. An OR gate is to be used in the construction of this system. Describe suitable input and output arrangements for the gate.

.....

.....

.....

.....

.....

.....[3]

[Total: 6]

Question 11 is on the next page.

11 **(a)** An atom consists of a nucleus made up of protons and neutrons, surrounded by electrons.

(i) Which of these particles has a positive charge? .....

(ii) Which two of these particles have almost equal mass?

..... and ..... [1]

(b) A silver nucleus is denoted by $^{107}_{47}Ag$. State the number of protons and the number of neutrons in this nucleus.

number of protons = ... number of neutrons = ... [2]

(c) The graph in Fig. 11.1 shows part of the decay curve of a radioactive nuclide. The count rate is plotted against time.

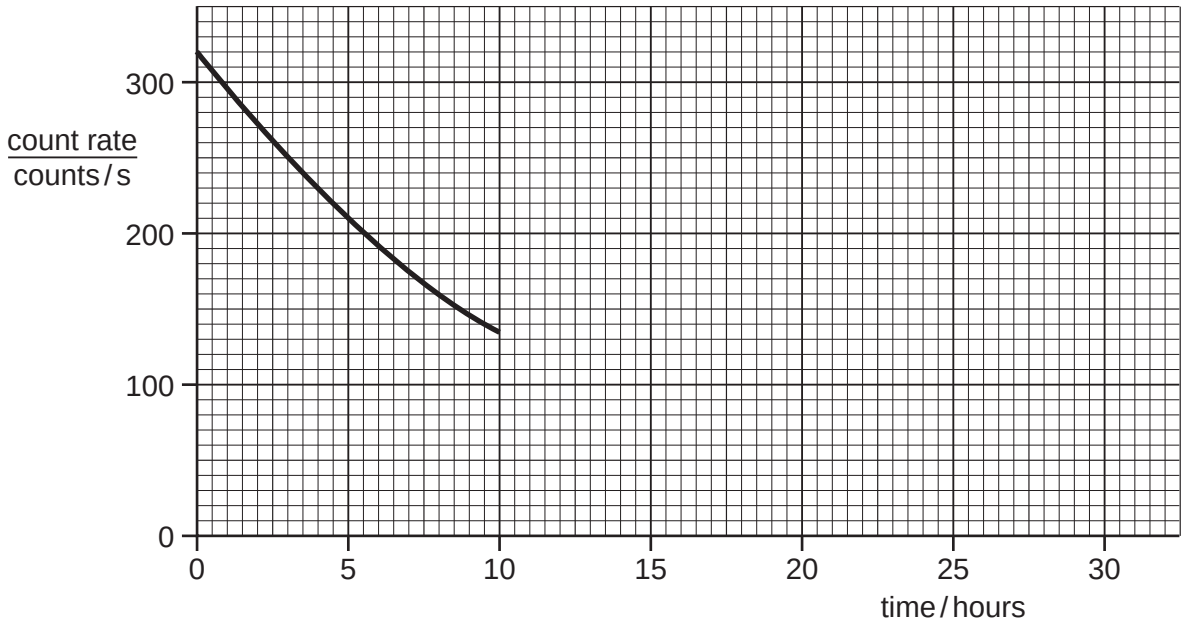

Fig. 11.1

(i) Use the graph to find the half-life of this nuclide.

half-life = ...[1]

(ii) Plot two more points on Fig. 11.1 at times greater than 10 hours. Use a dot in a circle to indicate each point. [2]

[Total: 7]