ANSWERS TO IGCSE EXAMS

In

PHYSICS

for

PAPER 3

Of

MAY/JUNE SESSION 2001

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Answers of PAPER 2 of MAY/JUNE SESSION 2001
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Centre Number	Candidate Number

Candidate Name ______________________________

International General Certificate of Secondary Education
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE

PHYSICS **0625/3**

PAPER 3

MAY/JUNE SESSION 2001 **1 hour 15 minutes**

Candidates answer on the question paper.
No additional materials required.

TIME 1 hour **15 minutes**

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.
Answer all questions.
Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES
The number of marks is given in brackets [] at the end of each question or part question.

FOR EXAMINAR'S USE	
1	
2	
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10	
Total	

This question paper consists of 14 printed pages and 2 blank pages.

SB CW/KN) 0F10310/2
 Turn over

(1) Fig. 1.1 shows the speed of a small, very dense object which is falling vertically from an aeroplane, up to the point at which it hits the ground. The air resistance on the object is negligibly small for the first 5s of its fall. The object is fitted with a parachute which springs open after a certain time of fall.

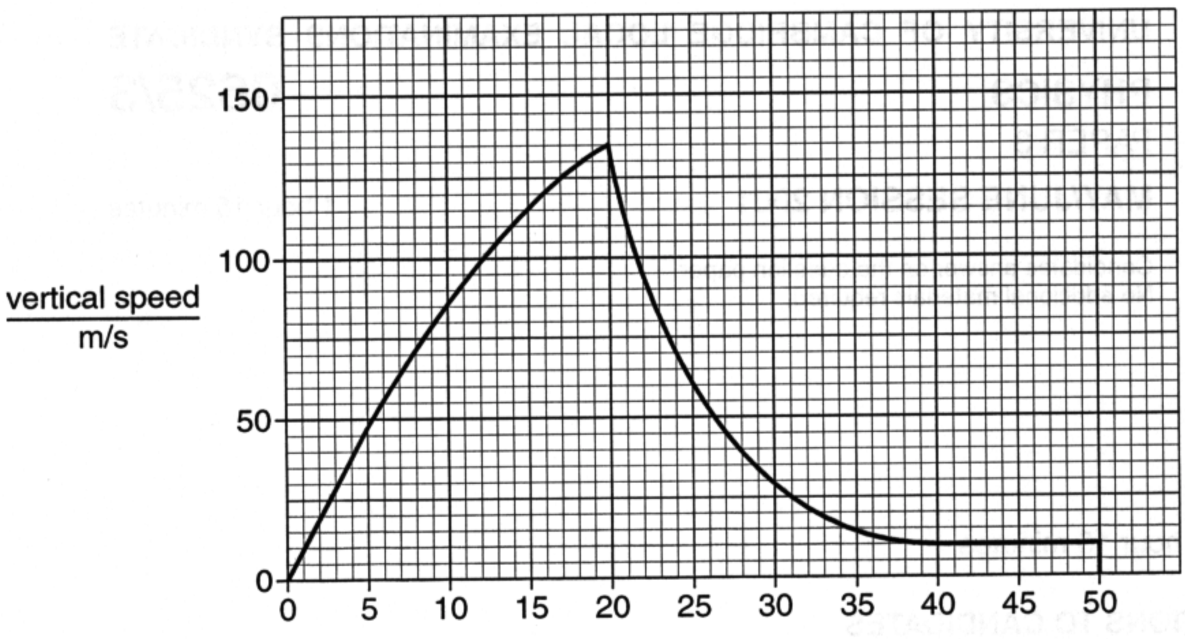


Fig. 1.1

(a) State the type of motion

(i) between 0 and 5 s,

The motion is a uniform motion with constant acceleration.

(ii) between 42s and 47s.

The motion has a constant speed with no acceleration

[2]

(b) Estimate the time at which the parachute opens.

The time is 20 seconds [1]

(c) On Figs 1.2 and 1.3, indicate by labelled arrows the vertical forces acting on the falling object

(i) after 3s of fall,

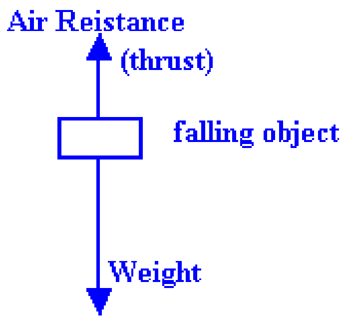


Fig. 1.2

(ii) after 45 s of fall.

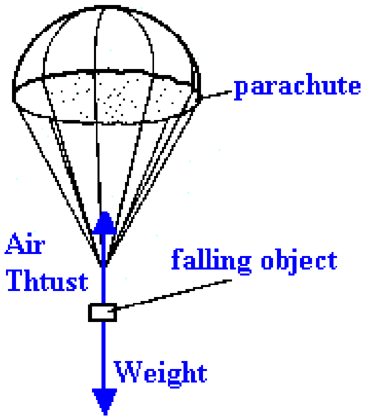


Fig. 1.3 **[3]**

(d) State whether or not there is a resultant vertical force acting on the falling object

(i) after 3 s of fall,

Yes. There is a resultant force in this period due to the acceleration of the object

(ii) after 45 s of fall.

No. There is not a resultant force in this period because it reached it terminal velocity

[1]

(e) Calculate the distance fallen in the firsts 5 s of fall.

Distance=area= ½ base × height= ½ × 5 × 49=122.5 m

distance fallen = **122.5 m** [2]

2 Fig. 2.1 shows a moving car on a level road.

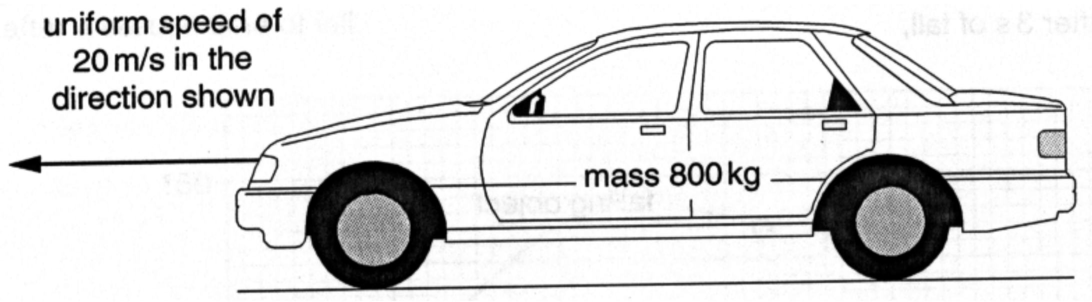


Fig. 2.1

(a) Calculate the momentum of the car.

p=m v= 800 kg × 20m/s =16000 Kg.m/s

momentum of car = **16000 Kg.m/s** [21

(b) The brakes of the car are applied for 4 s, which reduces the speed of the car to 5 *m/s*.

(I) Calculate the average force of the brakes.

$F=\Delta p/\Delta t=m(V_2-V_1)/t=800 \times (20-5)/4=3000$ N

average force = **3000 N**

(ii) Calculate the average deceleration of the car.

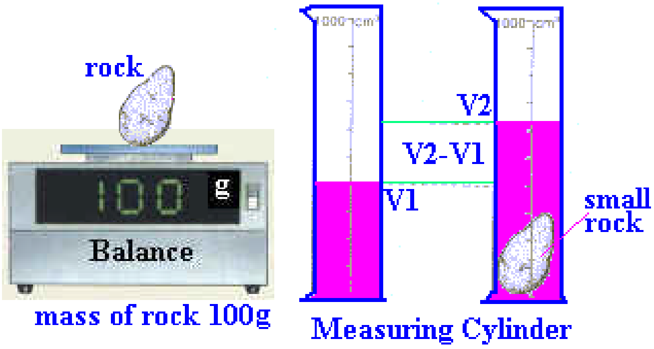
$a=f/m=3000/800=3.75$ m/s^2

average deceleration = **3.75 m/s^2**

[6]

3 Describe an experiment to find the average density of a small rock sample of approximately 100g mass.

(a) In the space below draw a labelled diagram of the apparatus.



[2]

(b) List all the measurements which must be taken.

- **Volume of water before placing the stone in measuring cylinder (V_1)**
- **Volume of water after placing the stone in measuring cylinder (V_2)**

[2]

(c) Explain how to work out the average density from the measurements taken.

- **Volume of rock $V_{rock} = V_2 - V_1$**
- **Density=mass/volume=100g/V_{rock}**

[2]

4 Fig. 4.1 shows a very magnified view of tiny dust particles suspended in still air, as seen under a microscope.

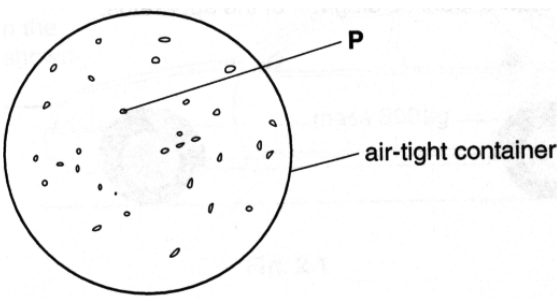
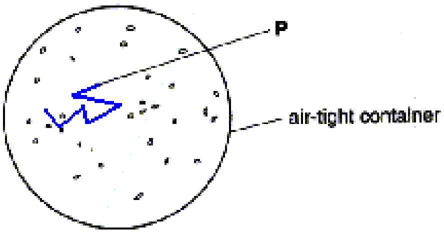


Fig. 4.1

(a) In the space below, draw a diagram to show how the particle labelled P would move when it is observed for a short time.



[1]

(b) With reference to dust particles and air molecules, explain the movement which you have drawn.

The relatively large dust particles are surrounded by much smaller and faster air molecules. Air molecules bombard the dust particles randomly from all directions causing the dust particles to move randomly in zigzag motion.

[2]

(c) Describe and explain how the movement would change if the temperature of the air in the container increased.

When the temperature increases, the air molecules gain kinetic energy and move faster and thus strike the dust particles more frequently and with greater force, causing a fast changing zigzag motion. Also they will strike the container wall more frequently and with greater force.

[2]

5 Fig. 5.1 shows apparatus which may be used to find the specific heat capacity of a liquid.

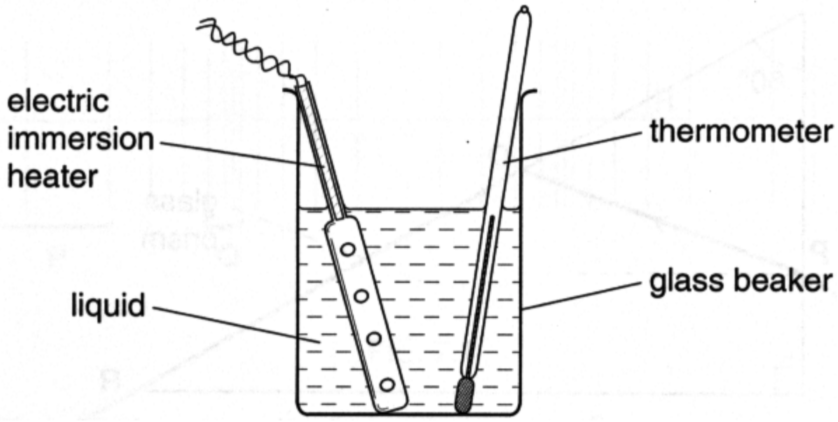


Fig. 5.1

The readings taken are:

power of the heater,	50W
time heater is switched on,	600s
initial temperature of the liquid,	20 ^{o}C
final temperature of the liquid,	65 ^{o}C
mass of the liquid heated,	200g

(a) Use the data to calculate the specific heat capacity of the liquid.

$H=cm(T_2-T_1)$, $H=Pt$

$c=Pt/m(T_2-T_1)=50w \times 600s/(200g \times (65-20)^{o}C)=3.33\ J/g^{o}C$

specific heat capacity = **3.33 J/g^{o}C** [5]

(b)

(i) Explain why the value obtained from this data will be higher than the actual value.

This is because of heat lost to the surroundings such as the container, the air around it, the thermometer, stirrer, …etc. Due to this heat lost, the rise in the temperature (T_2-T_1) is smaller than it should be. Hence, the calculated value for "C" is greater than the true value.

(ii) Describe one addition to the apparatus which would make the calculated experimental value nearer to the actual value.

By adding lagging to the glass beaker. This lagging will minimize heat lost to surrounding and keep (T_2-T_1) close to the actual value and hence the calculated value of "c" would be much close to actual value.

[3]

6 Fig. 6.1 shows some apparatus in use in an experiment to find the critical angle for blue light.

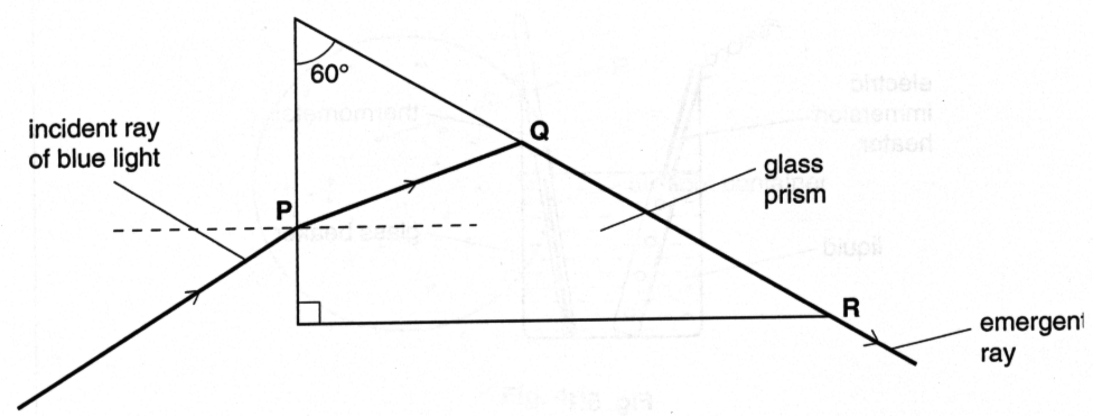
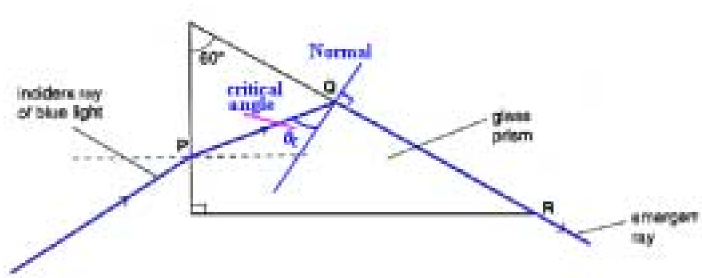


Fig. 6.1

The ray hits the prism at point "**P**" then crosses the prism to point "**Q**". Part of the ray emerges along the surface "**QR"** as shown.

(a) (i) By using measurements taken from the diagram, find the critical angle of the glass for blue light.



critical angle =**41°**

(ii) Use your value to explain how total internal reflection of blue light could be made to occur at point Q.

Total internal reflection occurs when the incident angle of blue light at point "Q" is always greater than the critical angle of the prism.

[4]

(c) Using measured angles on the diagram, calculate the refractive index of the glass for blue light.

Sin(critical angle)=1/n

n=1/Sin(critical angle)=1/Sin(41)=1.52

refractive index =**1.52** [4]

7 Fig. 7.1 shows an unlabelled diagram which a teacher draws to represent a sound wave in air.

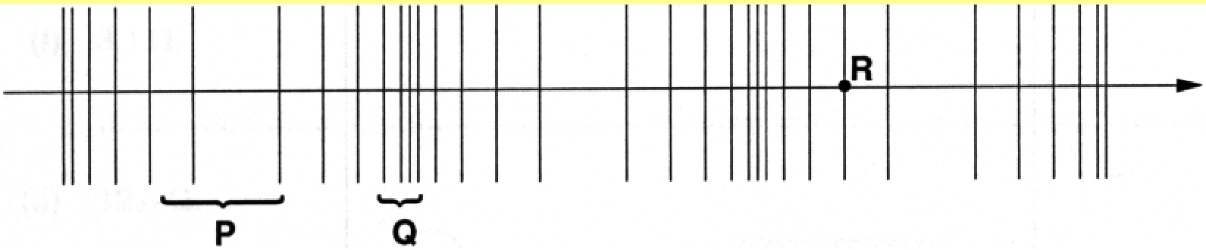


Fig. 7.1

(a) What label should be put on the line with the arrow?

Direction of sound wave travel [1]

(b) (I) What does the uneven spacing of the lines show?

It shows compressions and rarefactions in the surrounding medium resulting from sound wave.

(ii) What is being shown at P?

It shows rarefactions in the surrounding medium resulting from sound wave.

(iii) What is being shown at Q**?**

It shows compressions in the surrounding medium resulting from sound wave.

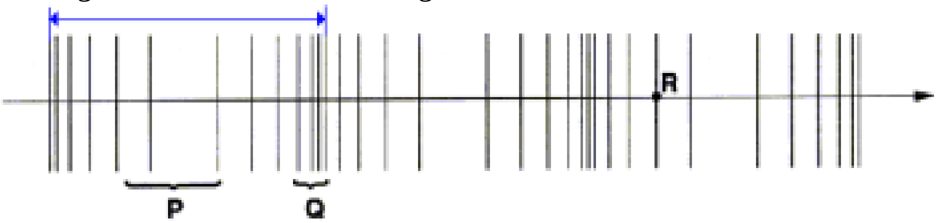
[2]

(d) Describe the motion of an air particle at R.

At "R" the particle will vibrate horizontally due to longitudinal nature of found waves.

[2]

(e) From Fig. 7.1, measure the wavelength of the sound wave.



wavelength = **4.1 cm** [1]

8 (a) Fig. 8.1 shows a coil of thin wire and a lamp connected to a 4 V supply.

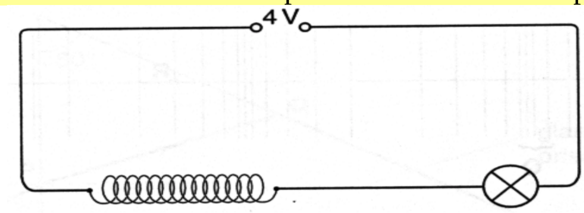


Fig. 8.1

The lamp is marked 1.5 V, 0.6 W. The lamp lights at normal brightness. Calculate

(I) the current in the lamp,

P=IV

I=P/V=0.6/1.5=0.4 A

current =**0.4 A**

(ii) the resistance of the lamp,

$P=V^2/R$

$R=V^2/p=1.5^2/0.6=3.75$ ohms

resistance = **3.75 ohms**

(iii) the charge flowing through the lamp in 20s.

I=Q/t, Q=I t= 0.4×20=8 coulombs

charge =**8 coulombs**

[5]

(b) The resistance of the coil of wire shown in Fig. 8.1 is 6.2 Ω and its length is 1 m. Using only 1.0 m lengths from the same reel of wire, and without cutting any of them, state how you would produce a resistance of

(i) 3.1 Ω,

Connect two coils in parallel. Because, $R_{eq}=6.2\times6.2/12.4=3.1$ ohms

(ii)12.4 Ω.

Connect two coils in series. Because, $R_{eq}=2\times6.2=12.4$ ohms

Complete the circuits in Fig. 8.2 and in Fig. 8.3 to show how the lengths of wire are connected in each case. [3]

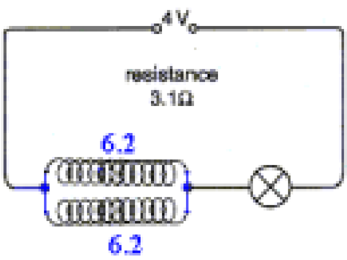


Fig. 8.2

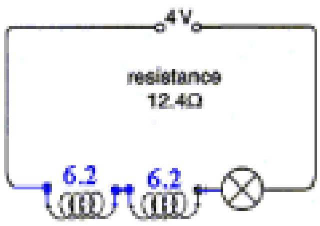


Fig. 8.3

(c) In a similar circuit to that shown in Fig. 8.1, the resistance of the coil is 5.0 Ω and the current through it is 0.6 A. Calculate the heat energy produced in the coil in 20 s.

$E=pt=I^2Rt= 0.6^2 \times 5 \times 20 =36$ joules

energy = **36 joules** [3]

9 Fig. 9.1 shows a transformer.

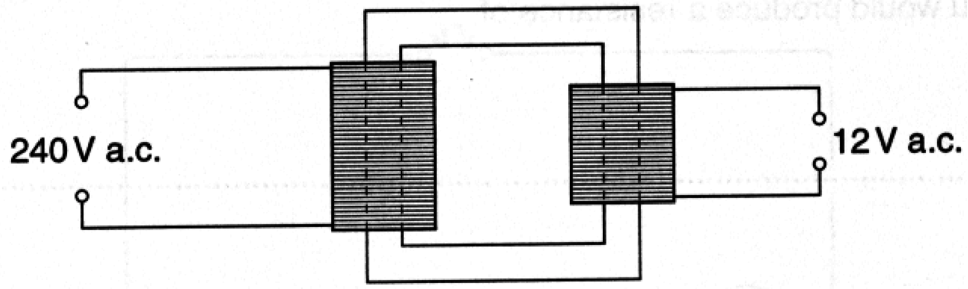


Fig. 9.1

(a) Explain

(i) why a secondary output is obtained even though there is no electrical connection between the primary and secondary coils,

Because the 240V A.C. input voltage produces a varying magnetic field around the primary coil which is focused by the core to pass through and cut the turns of the secondary coil resulting in a charges movement through the coil that induces the emf of 12 V A.C. in secondary coil.

(ii) why there would be no output voltage if the primary coil were connected to a 240 V d.c. supply.

Because a 240V D.C. input voltage produces a non-varying magnetic field around the primary coil.

[5]

(b) The transformer is assumed to be 100% efficient.

(I) There are 100 turns on the secondary coil. How many turns are there on the primary coil?

$V_p/V_s=N_p/N_s$

$N_s=N_pV_p/V_s=$ **100 12/240=5 turns**

turns on the primary = **5 turns**

(ii) The output current is 4.0 A. Calculate the input current.

$I_pV_p=I_sV_s$

$I_p=I_s\ V_s/V_p=$ **4 12/240=0.2 A**

input current =**0.2 A**

[4]

10 (a) Complete the following table for a-particles. The first answer has been given.

property/nature	complete this column	
symbol	${}_2^4He$	(hint: it is a helium nucleus)
Mass number	**4**	
Charge	**+2p (p: proton charge)**	(hint: write down the number of proton charges)
Ionization of gases	**Strong**	(hint: choose from: strong, weak or almost none)
Deflection in Magnetic field	**Right angles to the magnetic field lines**	(hint: choose from: towards N, towards S or at right angles to the magnetic field lines)
Deflection in electric field	**Toward negative**	(hint: choose from: towards +ve, towards -ve or no deflection)

(b) Fig.10.1 shows the paths of a-particles scattered by the nuclei of metal atoms in thin foils.

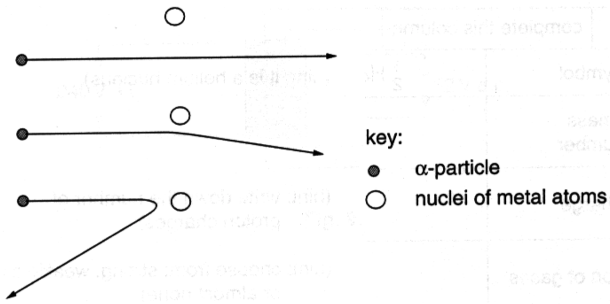


Fig. 10.1

Explain what can be deduced from the paths shown in Fig. 10.1 about

(I) the mass of the nucleus of a metal atom compared to the mass of an α-particle,

The mass of the nucleus of the metal is greater than the mass of the α-particle.

(ii) the charge on the nucleus of a metal atom,

The charge on metal nucleus is same as charge of α-particle

(iii) the volume occupied by a metal atom compared to its nucleus.

The volume of the metal atom is much grater that than the volume occupied by the metal nucleus.

[5]