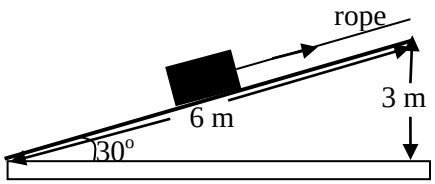
PAST GCE QUESTIONS MEETLEARN.COM

2007 Past GCE Questions

JUNE 2007

1. (a). The figure below shows a rough rigid board 6 m long used as an inclined plane, to raise a rectangular mass of 120 kg up to a height of 3 m above the ground at a building site. A force of 800 N in the rope parallel to the plane moves the load up the plane with a uniform velocity.



i.On a sketch diagram, indicate and name all the forces acting on the load as it moves up the plane. (4marks)
ii.What is the advantage of using the inclined plane instead of lifting the load vertically? (1 mark)
iii.What would be the change in potential energy of the load by the time it gets to the top of the building? (2marks)
iv.Define the efficiency of such a system, and calculate its value for the system above. (4 marks)
v.State why the efficiency above is less than 100 % (1mark)
(b). i. Distinguish between speed and velocity. (1 mark)
ii. Where on the globe (poles or equator) would the weight (force of gravity) on an object be smaller? Explain (2 marks)
iii. Explain what is meant by the "inertia of a body". How can this concept of inertia of a body be advantageously used? (2 marks)

2. (a). Pressure was measured at different depths in a certain liquid and the results below were obtained.

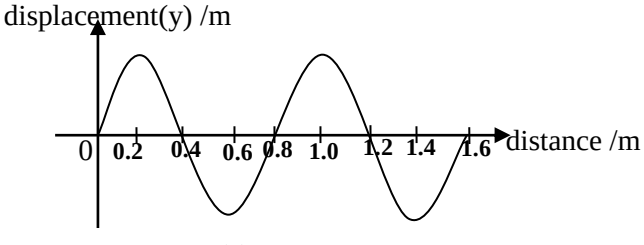
Pressure/ x 10^5 N/m^2	1.08	1.16	1.24	1.32	1.40	1.48	1.56	1.64
Depth/m	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

(i). Plot a graph of pressure (y-axis) against depth (x-axis) (4 marks)
(ii). Find the gradient of the graph. (2 marks)
(iii). Determine the pressure when the depth is zero and state what it represents. (2 marks)
(iv). If the gradient = ρg, find the density, ρ of the liquid (g is acceleration due to gravity). (2 marks)
(b). A girl subjects equal lengths of a wire and a rubber band to the same varying stretching forces starting with an force of 10 N. She makes the following observations in the course of the investigation.

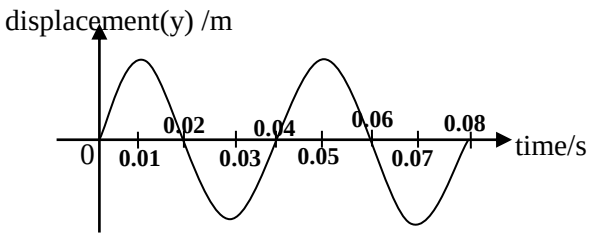
- Every 10 N added to the stretching force produces an extension of 0.002 m in the wire.
- Up to a maximum force of 250 N for the wire and 500 N for the rubber, they would just return to their original lengths when these forces are removed.

(i). What term can be used to describe the behavior of the wire and the rubber band? (1 mark)
(ii). Explain whether each material obeys Hooke's law. (a sketch of the graph in each case maybe necessary). (4 marks)
(iii). Define elastic limit and state its value for the wire. (2 marks)

3. (a). The figure below shows two different graphs of the same wave motion.



(a)



(b)

(i). Identify which of the two graphs (a or b) uses the displacement of one particle of the transmitting medium and one uses the displacement of different particles o the transmitting medium. (2 marks)
(ii). What is the periodic time and wavelength of the wave motion? (2 marks)
(iii). Calculate the speed of the wave. (2 marks)
(iv). The graphs could represent whether a transverse or a longitudinal wave. In terms of the motion of the particles, distinguish between the underlined words. (2marks)

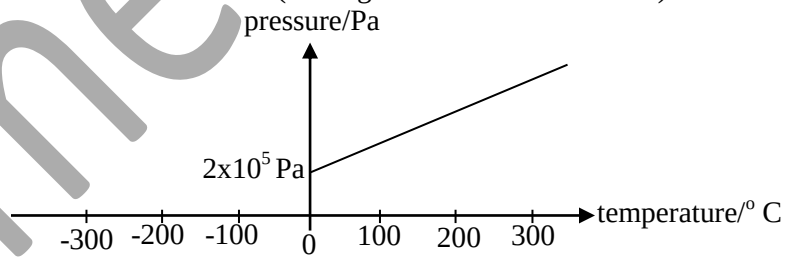
b).(i).Explain why the different strings of a guitar having the same length produce notes of different frequencies when plucked. (2 marks)
(ii). For a given string of a guitar, the frequency of the note it emits can be changed by either tightening the string orpressing it down with a finger. For each of he underlined phrases,
- State how a property of the string is affected and
- How the frequency of the notes emitted depends on this property (4 marks)

c). State one real life situation where:
(i) Electromagnetic waves are useful. (1 mark)
(ii) Mechanical waves are useful. (1 mark)
(iii) Name any one property common to all waves (1 mark)

4. a). Explain why
(i) More thermal energy is required to raise the temperature of 2 kg of a substance by 10 ^{o}C than is required to raise the temperature of 1 kg of the same substance by 10 ^{o}C. (2 marks)
(ii) A solid expands when heated. (2marks)
b). Water is known to have a higher specific heat capacity than oil.
(i). Give one practical use of water which depends on its high specific heat capacity. (1 mark)
(ii). On the same axes, sketch graphs of heat absorbed (ΔQ) on the y-axis against temperature change ($\Delta\Theta$) on the x-axis for 2 kg of each of the liquids (for temperatures below their boiling points). (2marks)

(iii). Give the physical meaning of the gradients of the graphs. (1 mark)
(iv). In a carefully conducted experiment, the gradient of the graph for 2 kg of oil was found to be 5000 J/K. Use the graphs and these figures to find the specific heat capacity of the oil. (2marks)
c). (i). Define the specific latent heat of vapourisation of a substance. (2marks)
(ii). Explain why the specific latent heat of vapourisation of a substance is much greater than its specific latent heat of fusion. (2marks)
(iii). Give two differences between boiling and evaporation. (2marks)
(iv). State one way by which evaporation can be increased. (1 mark)

5. a). The figure below shows how the pressure of a given mass of gas varies with temperature at constant volume. Its pressure at 0^{o} C is 2.0 x 10^{5} Pa. (The figure is not drawn to scale).



(i). What is the value of -273 ^{o} C on the thermodynamic scale? (1 mark)
(ii). What would you expect the pressure to be at -273 ^{o}C? (1 marks)
(iii). If the pressure of the gas pressure changes by 1/273 of its pressure at 0 ^{o}C for every 1 ^{o}C change in temperature, determine its pressure at 100 ^{o} C (2 marks)

a) Use your knowledge of the kinetic theory to explain:
(i). Why the pressure of a fixed mass of gas increases when its volume decreases at a constant temperature. (2pts)
(ii). Why the molecules of a gas would move faster when the temperature of the gas is raised. (2 marks)

(iii). Name one practical device which makes use of the incompressibility of liquids. (2 marks)

b) During cooling, water has its minimum volume at 4 ^{o}C. Below 4 ^{o}C, the water instead expands until it freezes at 0 ^{o}C with a very sharp increase in volume.

(i). Explain how this behavior is a natural advantage to aquatic life in winter when temperature can reach -10 ^{o}C. (3 marks) (ii).

Give two disadvantages of this behavior of water during winter (2 marks) (iii).

At what temperature would water have its maximum density? Explain. (2 marks).

6. a). You are provided with a plane mirror and a convex lens in suitable holders and an object in the form of illuminated cross wires in a hole on one side of a ray box. Describe how you would use these pieces of apparatus to obtain the focal length of the convex lens. Your account should include:

- A diagram of how the apparatus is set up including rays showing where the image of the object is formed. (3 marks)
- What you would do to obtain the required image. (2marks)
- The measurement(s) you would make. (1 mark)
- How you would use the measurement(s) to obtain the focal length of the lens. (1 mark)

b). (i). Describe two everyday observations due to refraction. (2marks)

(ii). Explain what is meant by the saying that the critical angle for water is 48 ^{o}C. (2marks)

c). (i). Define the refractive index of a substance. (2marks)

(ii). A black cross was marked on the inside surface of the bottom of a beaker. A travelling microscope was then focused on the cross vertically from above and its reading was 17.5 cm. When the beaker was filled with a transparent liquid to a depth of 9 cm and the microscope refocused on the cross, its reading was 16 cm. Use these readings to determine: the true depth of the liquid, the apparent depth of the liquid and hence its refractive index. (4 marks)

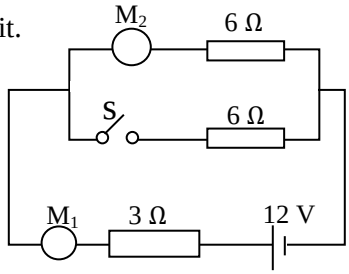
7. a). You are provided with a glass rod, a piece of woolen cloth and two conducting spheres A and B on insulating stands.

(i). Explain how you would charge the rod, stating how electrons are transferred during the process and the charge acquired by the rod. (3 marks)

(ii). Describe TWO main stages you would follow to give the two spheres equal but opposite charges using the charged rod, without touching them. Draw a diagram showing the charge distribution on the spheres after each step.

(iii). If two spheres are now connected with a wire through a milliammeter and it reads 3 x 10^{-4} A for 2 x 10^{-2} s, determine the magnitude of the charge each sphere acquired and state the direction of current flow between the spheres. (2marks)

b). The figure below shows a simple circuit.



Determine the readings of the meters M_1 and M_2 when the switch S is:

(i). Open (3 marks)

(ii). Closed. (3 marks).

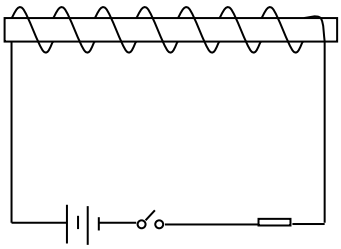
(iii). Would the battery last longer with the switch S permanently opened or closed? Explain your answer. (2marks)

8. a). (i). State the voltage and the frequency of the a.c mains used in Cameroon. (2marks)

(ii). Draw a sketch diagram of the ring mains circuit showing the supply and one socket correctly connected. (3 marks)

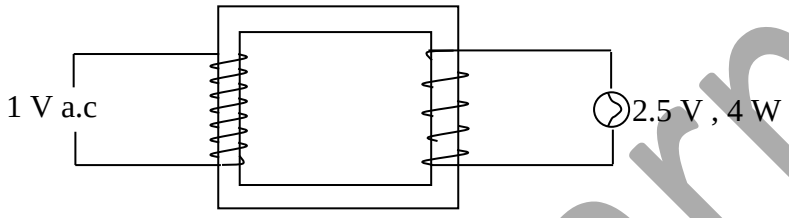
(iii). Give three advantages of the ring mains circuit. (3 marks)

b). The figure below shows a length of copper wire wound on a cardboard tube and its ends connected to a battery through a rheostat and switch.



(i). Copy the diagram and sketch the magnetic field when the switch is closed. Indicate its polarity. (2 pts)
(ii). Explain why the magnetic field of the tube would become stronger if soft iron is put inside it. (2marks)
(iii). State one other way of making the magnetic field of the tube stronger. (1 mark)
(iv). Name one device which makes use of an electromagnet. (1 mark)

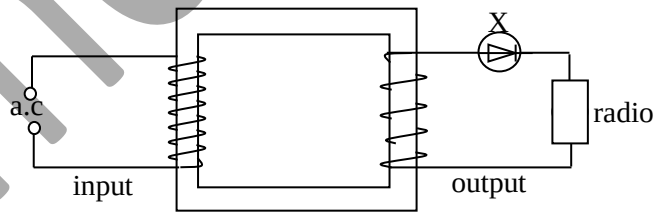
c). The figure below shows a transformer operating from a 1 V a,c supply. A 2.5 V, 4 W lamp connected to the secondary of the transformer lights normally.
(i). Explain why the lamp would not light if the 1 V a.c supply were replaced with a 1 V d.c supply. (2 pts)
(ii). Calculate the current in the primary coil, stating any assumption you made in your calculations. (3marks)



9. a). $^{12}_{6}C$ and $^{14}_{6}C$ are two different atoms of carbon. One of them is radioactive with a constant half life of 5700 years.
(i). State one way in which $^{12}_{6}C$ differs from $^{14}_{6}C$ other than radioactivity. (1 mark)
(ii). What term is used to describe the two atoms? (1 mark)
(iii). Use your knowledge of N/Z ratio and suggest which one of the atoms is likely to be radioactive. (3 marks)
(iv). Explain what the underlined phrase means. (2marks)
b). The count rate of a radioactive source was measured at different times and the information tabulated as shown below.

Time /minutes	0	15	30	46	60	75
Count rate/counts per minute	240	187.5	150	120	102	99
Corrected count rate				95		

(i). Briefly explain why the count rate reduces with time. (2marks)
(ii). Calculate the background count. (2marks)
(iii). Without drawing a graph, suggest an approximate half-life of the source. (1 mark)
c). The figure below shows the input and the output connection of a small transformer made by a student.



(i). Identify the circuit component X. (1 mark)
(ii). On separate axes, draw the waveforms of the input and that through the radio. (2marks)
(iii). Explain how the circuit component X affects the performance of the radio. (2marks)