



G.C.E. (A/L) Student Support Seminar - 2013
Revision Paper
Physics II
Launched under the Supervision of Ministry of Education
(All Rights Reserved) Time 3 hours

Index No:

Instructions

*This question paper consists of two parts; A and B. The time allocated for both the papers are three hours.

* Use of calculators is prohibited

Part - A Structured essays

*Answer all questions in this paper itself.

*Use the spaces given in the paper in answering the questions. Use only the spaces given in writing answers. Writing descriptive answers are not expected.

Part - B Essay Type questions

*Answer four questions only. Use the papers supplied in answering questions. Attach Paper A to Paper B, keeping Paper A on top of the answer script and hand over the completed answer script to the supervisor.

* You are permitted to take Part - B of the question paper out of the examination centre.

For Examiners' use only.

For the second paper		
Part	Question No	Marks
A	1	
	2	
	3	
	4	
B	5	
	6	
	7	
	8	
	9 (A)	
	9 (B)	
	10(A)	
	10 (B)	
Total		

Final Marks

In Figures	
In Letters	

Code Numbers

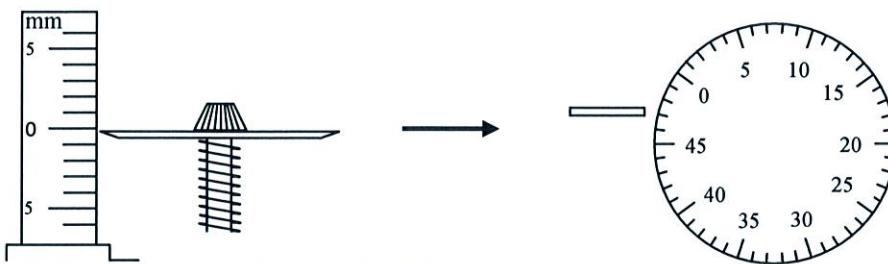
Examiner 1	
Examiner 2	
Checked by	
Supervision	

Part A - Structural Essay
Write answers for all the four questions on this paper
($g = 10\text{N kg}^{-1}$)

1. The pitch of a spherometer is $1/2$ mm and the circular scale divided into 50 parts.

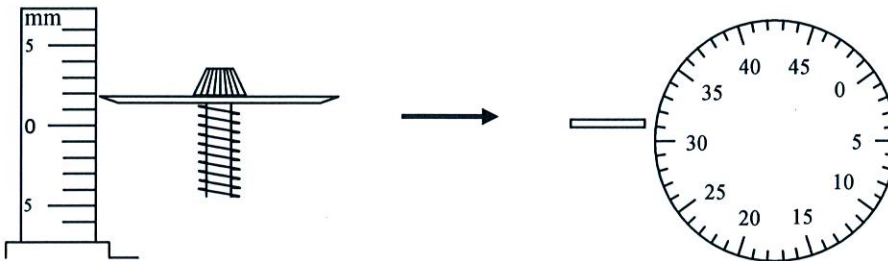
(a). What is the least count of the spherometer?

(b). The diagram shows an instance of testing the zero error.



What is the zero error as shown in the diagramme?

(c). The diagram below shows, a spherometer on a spherical surface and adjust for calculate the radius of curvature.



(i). What is the reading as shown in the diagram? -----

(ii). Find the accurate measurement of the spherical surface -----

(d). The distance between two legs of a spherometer is 3.0cm.

(i) Which instrument you use to measure this distance?

(ii) State the method that you follow for accuracy of the measurement d (i) of above .

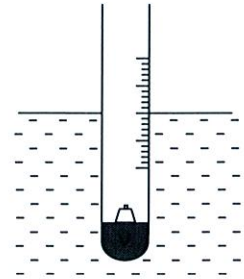
(e). Calculate the radius of curvature (R) using the measurement of above c (ii) and (d).

(f). The instrument given below are for determined the density of a stripe of wood which rough length, width and thickness are respectively 20 cm, 3 cm, 5 mm and the mass 18 g.

meter ruler, vernier calliper, micrometer screwgauge, spherometer, four beam balance, triple beam balance, electronic balance with least count 1 g

Clarify with reasons, which instruments from the given list that you are used to measure above rough measurement more accurately to calculate the density.☺

(2) The diagram shows a tube of volume V part of it has uniform crossection area A and other part is not uniform. Floting vertically that upper part kept above the water level. The mass of it could be changed by adding extra weights (m) into it. (The mass of empty tube is M).



(i) What are the forces act on it, when the tube is balanced?

(ii) Find the extra force act on it, when the tube dipped extra length x vertically. (Consider the density of liquid is ρ).

(iii) State an equation for the acceleration the tube gain when it released after dipped extra length x into the water.

(iv) The accelaration of a periodic motion $a = -kx$, then it is a simple harmonic motion. According to that how do you confirm above motion is a simple harmonic motion.

(v) Period $T = 2\pi\sqrt{\frac{1}{k}}$ when state the simple harmonic motion as $a = -kx$. So then write an equation for the period of this motion with the help of equation in part (iii). .

(vi) Using the equation you state for above (v) the density of the liquid can be found with the help of simple graphic method.

(a) What are the variables that selected for this?

(a) independent variable : -----

(b) Dependent variable : -----

(b) Rewrite the above (v) equation to find the density of the liquid by plotting a linear graph.

(c) According to it draw a sketch graph on given axis.



(d) State how would you find the density of the liquid using the graph.

(e) You have to find another measurment to calculate the density of the liquid. What is the measurment?

3. The unknown frequency of tuning forks could be find by using a sonometer.

(a) Which vibration/s is/are not related to explain the vibration of a sonometer wire from free vibration, damped vibration and forced vibration.

(b) Which type of wave that vibrating sonometer wire is formed, a transvers wave or a longitudinal wave?

(c) A vibrating tuning fork with unknown frequency placed on the sonometer box to vibrate the sonometer wire which has a mass M tied at free end.

(i) Help of resonance method how could the first harmonic or fundamental vibration of the sonometer wire is defined?

(ii) At which place of the sonometer box the vibrating tuning fork would be placed?

(iii) Write an equation for the frequency f when the distance between two bridges is l mass per unit length is m_0 and the string vibrates in first harmonic.

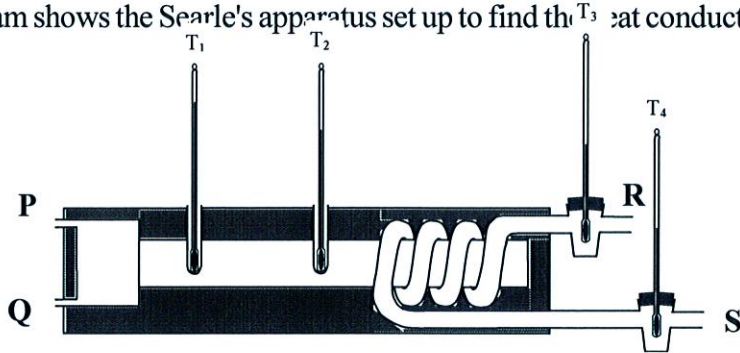
(iv) If $M = 2 \text{ kg}$, $m_0 = 0.5 \text{ g m}^{-1}$, $l = 50 \text{ cm}$, what is the velocity of the wave formed in sonometer wire?

(v) What is the frequency of the tuning fork?

(vi) Write a statement for acceleration of the sonometer wire which has a displacement x .

(v) When the sonometer set up the wire of it in vertical position, state giving reasons what happen to the speed of the above mentioned wave travelled up along the wire.

4 The diagram shows the Searle's apparatus set up to find the thermal conductivity of Copper metal.



(a) (i) State the position that steam is entered into the steam chamber. Give reasons for it.

(ii) State the position that cool water is entered to absorb the heat flow along the rods. Give reasons for entered like this.

(iii) State action that you take to keep good contact of heat between Copper rod and the thermometer.

(iv) Explain why the Copper rod covered with a good heat conductors.

(b) The front end of the insulated Copper rod heated using steam in $100\text{ }^\circ\text{C}$ and the back end that wound with a metal coil flowing cold water. The measurement are taken when the system in the steady condition

$\theta_1 = 74\text{ }^\circ\text{C}$, $\theta_2 = 55\text{ }^\circ\text{C}$

Distance between the thermometers T_1 and $T_2 = 150\text{ mm}$

The temperature of water entering = $16\text{ }^\circ\text{C}$

The temperature of water coming out = $25\text{ }^\circ\text{C}$

The mass of the water collected within 60 minutes = 0.15 kg

The diameter of the Copper rod = 50 mm

The specific heat capacity of water = $4200\text{ J kg}^{-1}\text{ K}^{-1}$

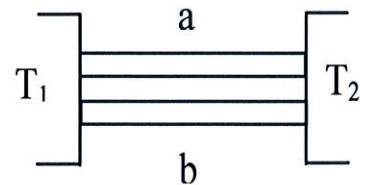
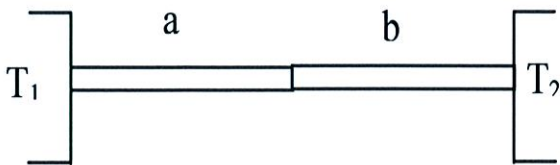
(i) Find the temperature gradient along the rod.

(ii) Why the heat flow along the rod reach the steady condition?

(iii) Find the rate of absorpton of heat by water?

(iv) Find the heat conductivity of Copper.

(c) The two rodes made by different metals with same length placed between two areas with different temperature in series and parallel as shown in the diagram.



In which instance above the heat flow is in higher rate?



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Part B
Answer only four questions,
($g = 10 \text{ N kg}^{-1}$)

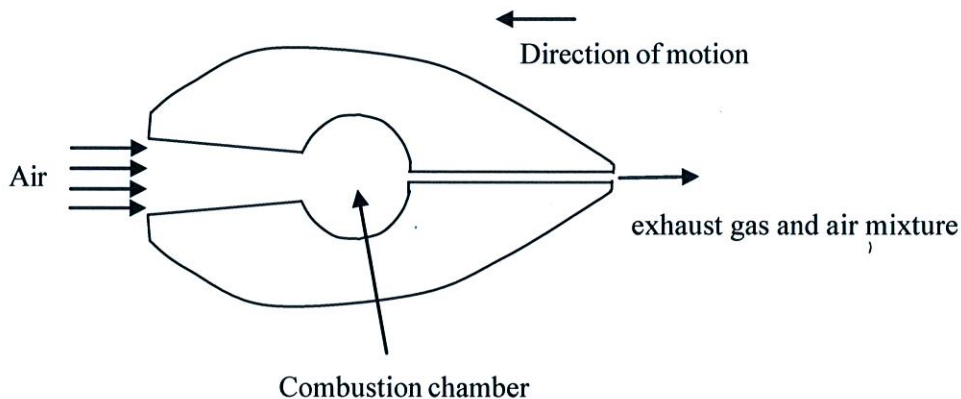
- (5) (a) Explain using diagrams how an aeroplane lift when an air stream flow through the wings.

State the principle that you used for this.

(b) The speed of air flow over the wings of an aeroplane is 135 m s^{-1} , under the wings speed of air is 120 m s^{-1} and the effective area of the wings are 28 m^2 . Then,

- (i) Find the pressure difference act on the wings.
(ii) The boyancy force exert on the lift.

(c)



The diagram above is a rough diagram of an aeroplane jet engine. When the aeroplane moved in a speed of 250 m s^{-1} the rate of air intake to one jet engine is 220 kg s^{-1} . The fuel burn inside the combustion chamber exors gas and the air mixture exit with a speed of 420 m s^{-1} from engine.

- (i) Find the momentum of air entered in a second into a jet engine.
(ii) Find the momentum of exit exors gas and the air mixture in a second.
(iii) Find the up thrust of one jet engine. State your reasons clearly.

(d) The speed of the aeroplane is 50 m s^{-1} when it's landing. The radius of each wheel of the plane is

.25 m and the moment of inertia 110 kg m^2 .

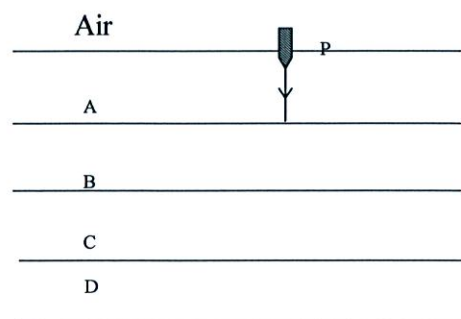
Each tyre takes $1.4 \times 10^4 \text{ N}$ of the whole weight of the plane. The rotation of the tyres are started at the moment of touch with with the ground and after 0.480 s gain angular velocity related to the speed. Think that the sped of the plane is constant in the runner way.

- (i) Find the angular velocity gain by the tyres during this time.
- (ii) Find the angular accelaration of tyres.
- (iii) Find the torque act on the tyres.
- (iv) Find the coefficient of dynamic friction between the tyres and the ground.

06. In experiments of find out the oil deposits, identify the structure and the location by trnsforming transverse and longitudinal wave vibrates into the earth at the place and identify the waves return after reflection and refraction of different layers using suitable detectors.

Both transverse and longitudinal waves travels through solids but in liquids the transverse wave cannot travel.

(a) A,B,C and D shown in the diagram four horizontal parallel layers in the earth crust. A transverse wave signal and a longitudinal wave signal transformed perpendicular into the earth at the position P, the detector detect three return signals related to the transverse wave and more than three signals related to the longitudinal wave.



I. Explain givin reasons the structures of A,B,C and D are whether solid or liquid.

II The table shows the velocities of longitudinal waves in air, water, A, B, C and D.

Medium	velocity m s^{-1}
air	300
water	1500
A	7500
B	5000
C	9000
D	1800

(a) Find the reflective index of longitudinal wave traveled from air to medium A.

(b) A longitudinal wave falls at the angle of 45° to the normal of common surface AB, is it subject to the total internal reflection of the BC common surface? or not? Confirm it.

(b) The time taken from beginning for identify the return high intensity longitudinal wave signals above (A) from the indicator are 1.5 s, 2.5 s, 4.5 s and 7 s respectively.

(i) Find the distance from the surface level of the earth to the common surface of C and D layers.

(ii) Calculate the thickness of the D layer.

07. (i) State equations for inner and outer pressure difference of a drop of liquid which radius is r and surface tension is T .

(ii) Liquid with surface tension T and curved surface. The radius of curvature along two consider planes perpendicular to each other are r_1 and r_2 , the pressure difference of both sides of the liquid surface

$$\text{is } \Delta P = T \left(\frac{1}{r_1} + \frac{1}{r_2} \right).$$

When the shape of liquid surface is semi cylindrical and the radius of the cylindrical surface is r , what is the equation for pressure difference of the two sides of the liquid surface?

(iii) A glass sheet square in shape and length of a side 10 cm placed on a horizontal large glass surface. There is an oil layer thickness of 0.5 mm inbetween the glass sheet and the glass surface, at the room temperature 25 °C the surface tension of oil is $T_{25} = 7.5 \times 10^{-2} \text{ N m}^{-1}$ and mass of glass sheet is 200 g Calculate the force exert perpendicular to the glass sheet to remove it. (Consider the angle of contact for glass and oil is zero.)

(iv) The volume expansivity of oil is $100 \times 10^{-6} \text{ } ^\circ\text{C}^{-1}$ and at 35 °C the surface tension is $7.2 \times 10^{-2} \text{ N m}^{-1}$ If the room temperature increases from 25 °C to 35 °C, calculate the force exert perpendicular to the glass sheet to remove it.

8. (a) The gravitational field strength inner point of a spherical mass is $g = \frac{Gm}{r^2}$. Here r is distance from the centre to that point, m is the mass of spherical part with radius r . According to this,

Find the gravitational field strength of the given points bellow situated r distance from the radius point of a spherical solid with the radius of R and mass M . (Universal gravitational constant is G).

(i) A ($r < R$)

(ii) B ($r = R$)

(iii) C ($r > R$)

(b) Think that a hole is dig across of the earth which mass M and radius R . From one end of this hole a mass (m_0) allowed to drop.

(i) Find the force act on the mass (m_0) when the distance is x from the earth centre.

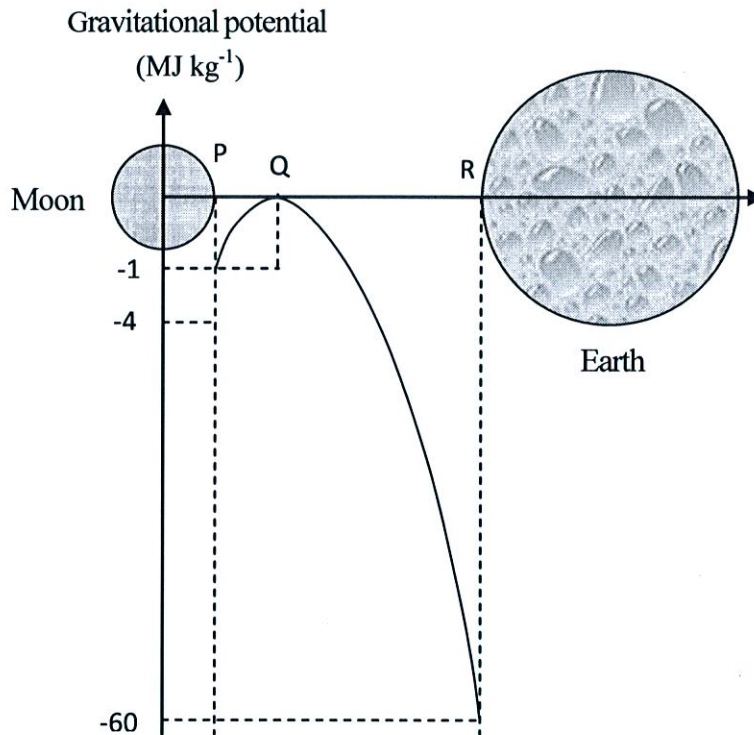
(ii) Using gravitational field strength g find that force at the earth surface.

(iii) Show this mass is subject to a simple harmonic motion and show the period it could get by

$$T = 2\pi \sqrt{\frac{R}{g}}$$

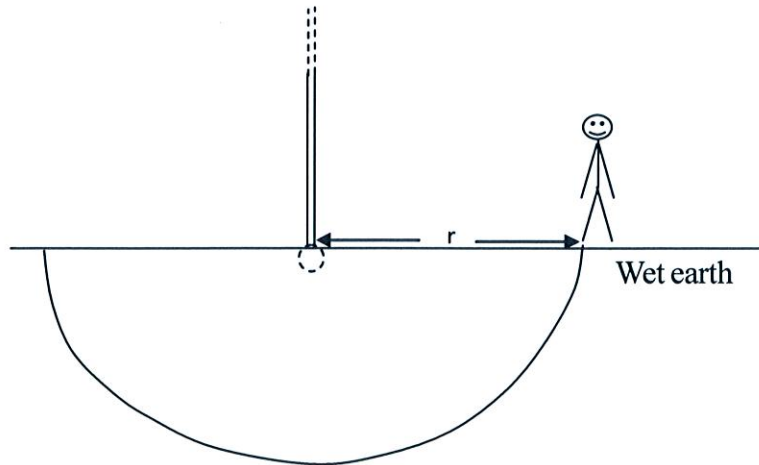
(c) It seems that some meteorites fall on to the earth are similar to the rocks on the moon. It believes that those are fallen from volcanoes on the surface of the moon.

The gravitational potential from moon to earth is changed as shown in the graph below.



Out of the points P,Q,R,

- (i) What is the gravitational potential of the highest point? How much is the value?
- (ii) At which point the gravitational field strength is zero?
- (iii) What is the gradient of the graph at point R.
- (iv) How much is the escape velocity of a 10 kg moon rock to gain at the moon to fall on to the earth?
- (vi) Calculate the velocity of it when it falls on to the earth.



09) A A bearfooted person while jogging in the morning, fell on to the ground near a electricity post that used to transmit electricity, and died on the spot. It is necessary to investigate into the cause of the death of the person, whether the death was caused by electrocution or a heart attack.

It was scientifically proved that a death could be occurred by a electric current of 0.1 A - 1 A going through a heart. It was discovered that there was a current leakage occurred in a period of one second in the day when the accident took place.

(a) Consider the leaked current is I and the leaked current spread in semi spherical area which radius is r find the current density (J) at the distance of r from the axis of the post.

(b) Consider the shape of the tower end of the post is a sphere with radius b and electric field strength at distance r from the post is $E = \delta J$ derive a statement for potential difference between the man and the foot of the tower.. (Here δ is electric resistivity.)

(c) Consider the $I = 100 \text{ A}$, $P = 100 \text{ m}$ and $b = 1 \text{ cm}$ and $r = 10 \text{ m}$

(i) Find the value of current density (J)

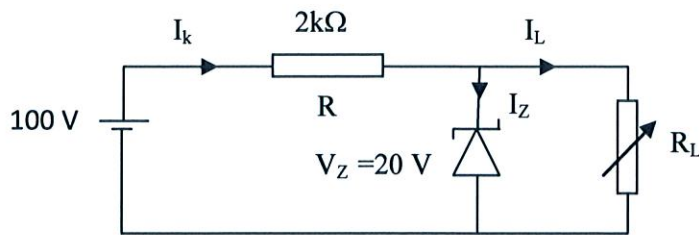
(ii) Find the potential difference between the man and the foot of the post.

(d) If the distance between the two feet of the man is 0.5 m, using above data find the potential difference between two feet of the man.

(e) The resistance of the ground between the two feet of the man is 300Ω and the resistance between one foot and other foot across the heart is 1000Ω consider above and calculate the current flowed across a foot .

(f) Conclude the factor caused for death of the man is current leakage or a heart attack.

9 B (a) Explain the term "break down" of Zener diode.



(b) In the above circuit the maximum current of Zener diode is 32 mA and Zener voltage $V_Z = 20$ V, when the load resistance is 0.4 k Ω and 2 k Ω , calculate the (i) to (iv).

- (i) Calculate the potential difference across R_L
- (ii) Calculate the potential difference V_R across R
- (iii) What is the current through the Zener diode?
- (iv) Find the power P_Z supplied to Zener diode.
- (v) In relation to maximum power $P_{Z(max)}$ of Zener diode, state whether the diode is damaged or not in above (iv)
- (vi) Calculate the range of values for load resistance R_L

10 A

A gas balloon made up of compressible light material with volume of 0.5 m³ is attached to a piece of iron with mass of 2.5×10^2 kg and was immersed into a reservoir. But it could not be dipped in water. Then a diver pulled it into the water and released.

The initial pressure of the balloon is atmospheric pressure 1.01×10^5 Pa.

- a
 - (i) What is the volume of the piece of iron attached? Density of iron is 7860 kg m⁻³.
 - (ii) What is the mass of air in balloon? Density of air is $.29$ kg m⁻³.
 - (iii) What is the volume of the balloon when it at the level of submerge and maintain equilibrium? Density of water is 1000 kg m⁻³.
 - (iv) If the temperature inside the water is equal to the temperature of the surface water, what is the pressure of air in balloon when it is submerged and maintain its equilibrium?
 - (v) Find the depth from the water surface to level of submerged equilibrium.
($g = 10$ m s⁻²)

b Imagin the surface temperature of water is 27 °C, and the temperature at the level of submerged equilibrium is 17 °C. Ignor the density change related to the temperature.

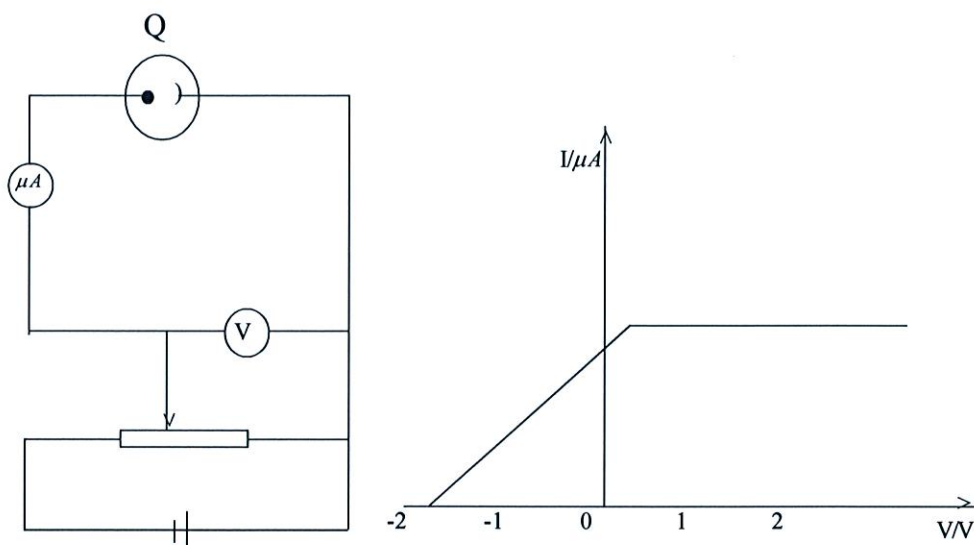
- (i) What is the volume of the balloon at the level of submerged equilibrium?
- (ii) Find the pressure of air in balloon at the level of submerged equilibrium.
- (iii) Find the depth to the level of submerged equilibrium under this condition.

c (i) Suggest another method to immerse the balloon into the water instead of pulling it. Give reasons for your suggestion.

(ii) The pressure in the balloon of the deep sea is very high. The life of bacteria living in the bottom of the sea is adapted to the high pressure. Explain what would happen to bacteria if this type of bacteria is taken to the top of the sea.

10 B

(a) The diagram shows a simple type of a photo electric cell used to test photo electric effect. The graph illustrates the variation of the potential difference and the photo current between cathode and anode.



(i) Explain giving reasons when change the terminals of the battery shown in the diagram and increased the (+) potential of Q but the photo current is constant.

(ii) Explain the cause for decrease the photo current when (-) potential of Q is increased.

(iii) Draw rough graphs for instance given below by copy down the given graph in your answer script.

- (A) Increase the intensity of light
- (B) Increase the frequency of light
- (C) Increase both the intensity and the frequency

(b)

metal	work function
Lithium	1.4 eV
Potassium	2.2 eV
Sodium	2.3 eV
Zinc	4.2 eV
Iron	4.5 eV
Silver	4.7 eV

Answer the following questions using the table above.

(i) Considering the wavelength of visible light is in the range of 400 nm - 700 nm, find out which metal out of the metal given in the table has photo electric effect? Planck constant is 6.6×10^{-34} J s.

(ii) Which metal has the maximum threshold frequency?

(iii) Which metal has photo electric effect for infrared light with wavelength more than 700 nm?

(iv) What is the maximum kinetic energy of electrons emitted when an electromagnetic wave of 300 nm wavelength falls on Zinc?

(v) What is the stopping potential to stop emission of electrons when a light with 500 nm wavelength falls on sodium?