HOLIDAY PACKAGE OF PHYSICS FOR S6PCM,S6PCB & S6MPG

1. A projectile is fired with an initial speed of 400m/s at an angle of 60° to the horizontal. determine the:

(a) Time to reach the maximum height. **(2marks)**

(b) Maximum height reached by the projectile. **(2marks)**

(c) the time of flight of the projectile before it hits the ground. **(2marks)**

(d) Horizontal range of the projectile. **(2marks)**

2. A lens forms an image of an object. The object is 16.0cm from the lens. The image is 12.0cm from the lens on the same side as the object.

(a) What is the focal length of the lens? **(2marks)**
(b) Is the lens converging or diverging? **(1mark)**
(c) If the object is 8.50mm tall, how tall is the image? **(2marks)**
(d) Is it erect or inverted? **(1mark)**

3.The eyepiece of refracting telescope has a focal length of 9.00cm. The distance between objective and eyepiece is 1.80m and the final image is at infinity. What is the angular magnification of the telescope? **(4marks)**

4. a) What do you understand the by terms:

(i) critical angle. **(2marks)**
(ii) Total internal reflection. **(2marks)**

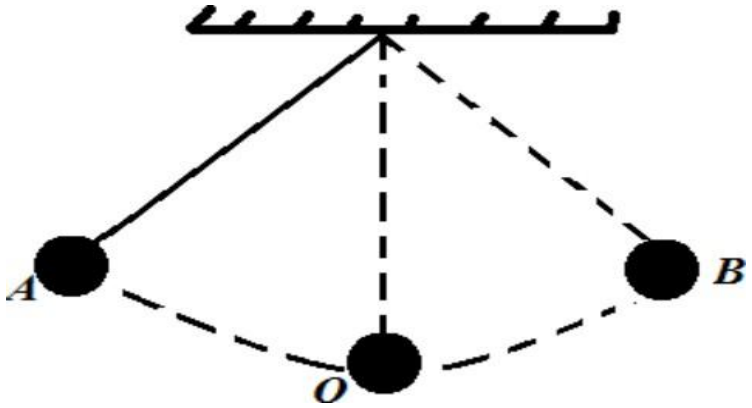
b)A ray of light passing through a glass prism of refracting angle 60^0, undergoes a minimum deviation of 30^0. Calculate;

i)The refractive index of the material of the grass prism**(2marks)**

ii)The critical angle for glass prism-air boundary. **(2marks)**

iii)The velocity of light in glass. **(2marks)**

5.A 50 g bob suspended on a string 25cm long is pulled aside a horizontal distance from the mean position 0 and then released from rest. The bob of a pendulum moves back and forth along the same path and passes through 0 as shown by fig below. The amplitude of oscillation is 10cm. Assume that all external forces are negligible except the gravitational force.



(a) Describe any three characteristic of simple harmonic motion

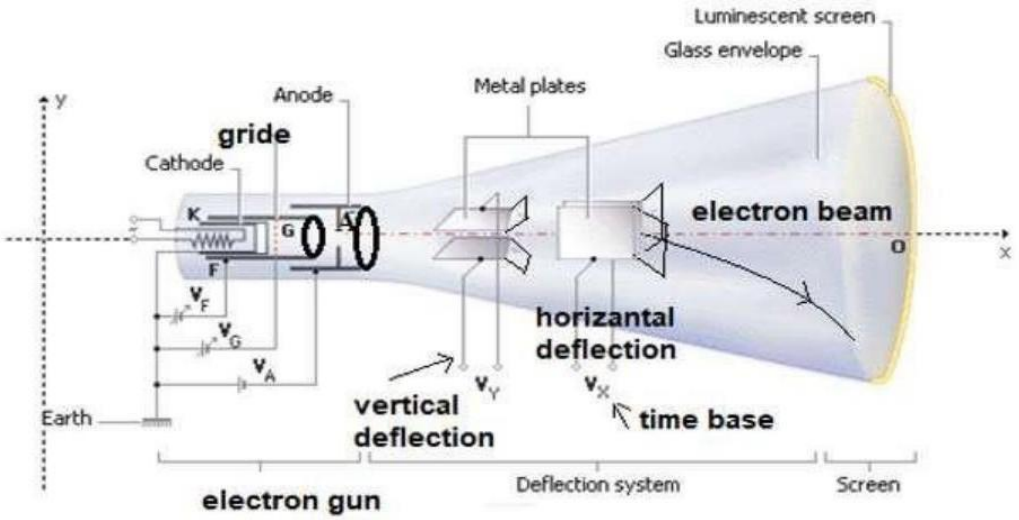
(b) Evaluate the period of this simple pendulum.

(c) Analyze the above oscillations and suggest the point among the point A, 0 and B in the path of its suing where the bob suspended on the string is characterized by the following physical quantities. Prove your answer with aid of calculation for each case.

(i) The greatest velocity.

ii)The greatest acceleration

6.Study and use the diagram below of Cathode Ray Oscilloscope to answer the asked questions:



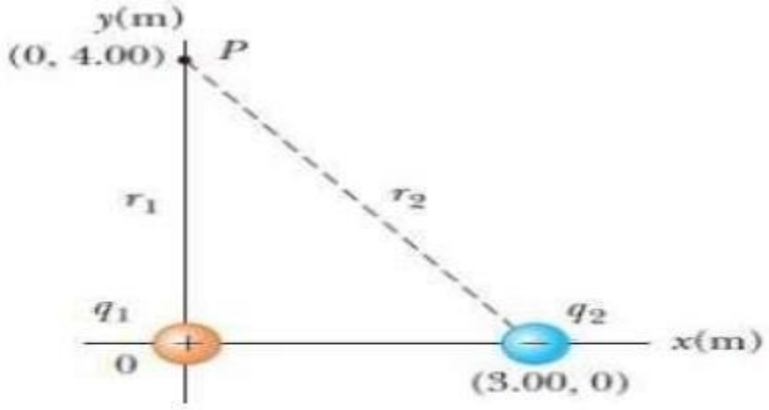
A) What is Cathode ray tube oscilloscope(C.R.T.O)?

B) Enumerate the main parts of Cathode Ray Tube Oscilloscope and the function of each one.

C) Give one strength and limitation of C.R.T.

7.a) A system consists of three particles, each of mass 5.00 g, located at the corners of an equilateral triangle with sides of 30.0 cm. Calculate the gravitational potential energy of the system.

b) A charge q1 = 2.00 μC is located at the origin, and a charge q2 = -6.00 μC is located at (0, 3.00) m, as shown in Fig. below:



i) Copy the above diagram and determine graphically the direction of the electric field E at point P due to the charges q1 and q2

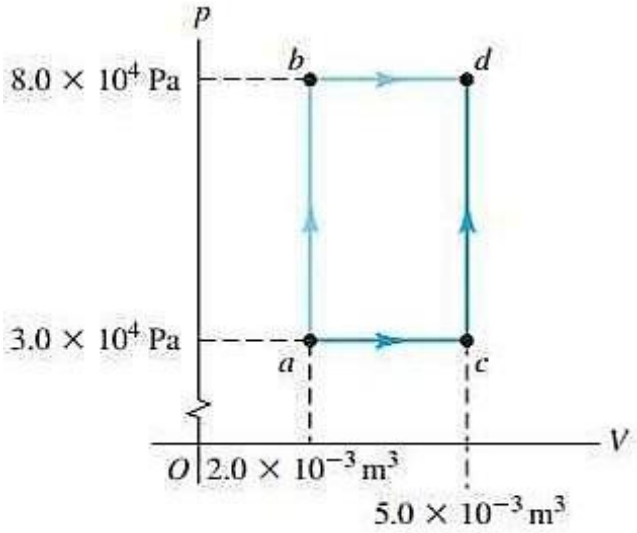
ii)Find the total electric potential due to these charges at the point P, whose coordinates are (4.00, 0) m.

iii)Find the change in potential energy of a q3 =3.00 μC charge as it moves from infinity to point P. Find the total potential energy of the system.

iv)Find the total electric potential of the system

8.The pV-diagram of Fig below shows a series of thermodynamic processes. In process ***ab***, 150 J of heat is added to the system; in process ***bd***, 600 J of heat is added.Find

a). The internal energy change in process ***ab***;
b) The internal energy change in process ***abd*** (shown in light blue); and
c) The total heat added in process ***acd*** (shown in dark blue).



9.a) Damping is negligible for a 0.150-kg object hanging from a light 6.30-N/m spring. A sinusoidal force with amplitude of 1.70 N drives the system. At what frequency will the force make the object vibrate with amplitude of 0.440 m?

b) A particle moving in the xy plane undergoes a displacement d □ (2.0i□3.0 j)m as a constant force F= (5.0i x 2.0 j)N acts on the particle.

(i) With examples, distinguish between vector to the scalar quantity
(ii) Calculate the work done by F.
iii) Calculate the magnitude of the displacement and that of the force.
iv) Calculate the angle between F and d

10. The displacement of pendulum of mass 0.4Kg with respect to time is given by $X = 10e^{-0.1t}\cos(4\pi t - \pi)$ x is in cm, t is in second. Calculate:

i)The initial amplitude

ii)The position at the origin

iii)Velocity at the origin

iv)Damping factor and damping coefficient

v)The viscous friction force

vi)Does the oscillating system under damped, critically damped or over damped? Justify your answer. (Assume the system spring constant k=450N/m)

11. Why does the reaction in the Sun occur only at very high temperatures?

(a) A slow neutron is absorbed by uranium-235 in the reaction:

$$^{235}_{92}U + ^{1}n \rightarrow ^{236}_{92}U \rightarrow ^{146}_{57}La + ^{87}_{35}Br + 3x + y$$

Binding energies per nucleon: ^{235}U: 7.59 MeV,

^{146}La: 8.41 MeV ^{87}Br: 8.59MeV, $^{1}n = 0MeV$

(i) What are X and Y in the reaction above?

(ii) Approximately how much energy is released in this fission reaction?

iii)When neptunium-240 decays, it releases a beta particle and gamma radiation. Write the complete decay equation for neptunium-240 and Identify the new element formed in the decay equation above

12. The photoelectric work function of potassium is 2.3eV. If light having a wavelength of 250 nm falls on potassium, find

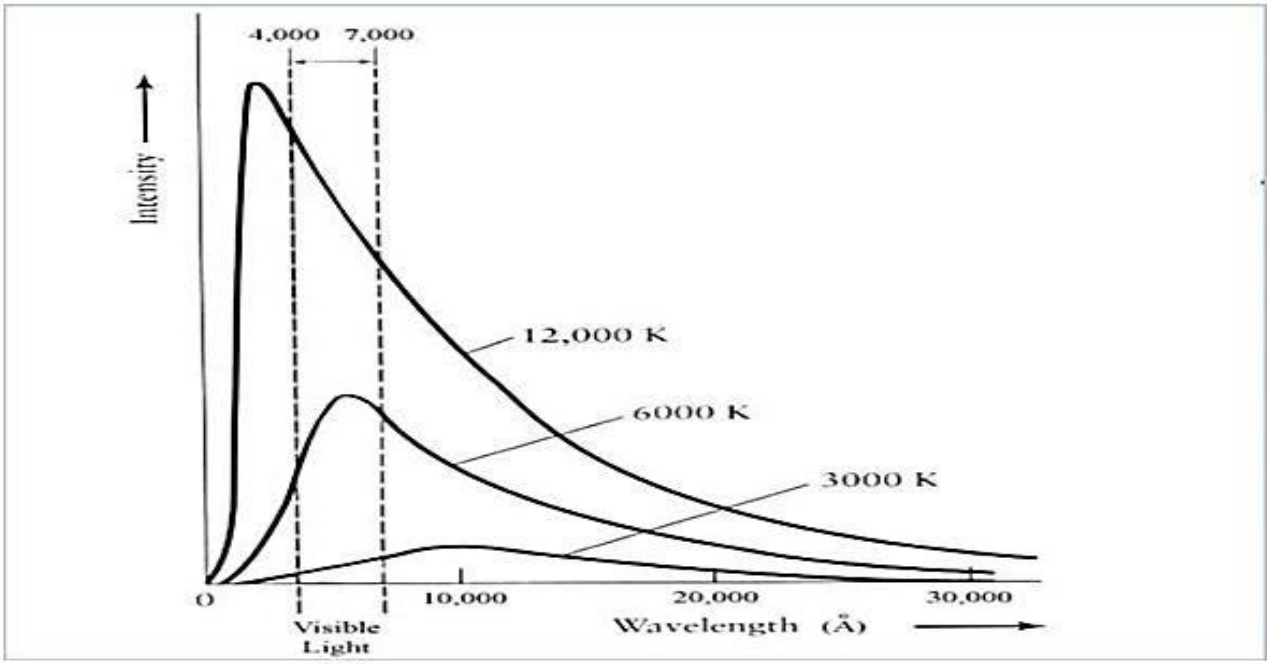
(a) The stopping potential in volts

(b) The kinetic energy in electron volts of the most energetic electrons ejected;

(c) The speed of these electrons.

13.a) State Wien's displacement law and its practical implications

b)Use the graph indicated below to answer the questions that follow:



(i) What does the graph explain?

ii) Explain the spectrum that is found between temperatures of 4000K and 7000 K

(iii) Why do you think the three curves have different shapes.

14. A thin taut string of length L and mass 200g tied at both ends vibrating in its 5th harmonic when disturbed and the motion of standing wave is described by the following equation:$\boldsymbol{y(x, t)}$**=5 6**$\boldsymbol{sin}$**(0. 0314**$\boldsymbol{x}$**-8**$\boldsymbol{t}$ **)in centimeter(cm),**t **is in seconds**:

(a) Draw a sketch that shows the standing wave pattern
(b) Calculate the amplitude of two travelling waves that make up this standing wave.
(c) Calculate the resultant amplitude at nodes.
(d) Calculate the wavelength of the wave.
(e) What is the length of the string?
(f) Calculate the frequency of the wave
(g) What is the tension used when disturbing the string?
(h) Calculate the distance between two consecutive node and anti-node
(i) Calculate the speed of this transverse wave.
(j) Calculate all lowest harmonics of this transverse wave.