TAYLOR'S COLLEGE

Wisdom · Integrity · Excellence

CAMBRIDGE 'A' LEVEL PROGRAMME

AS TRIAL EXAMINATION AUGUST/SEPTEMBER 2006

(Jan/March 2006 Intake)

Friday **1 September 2006** **8.30 am – 9.30 am**

PHYSICS 9702/01

PAPER 1 Multiple Choice **1 Hour**

Multiple Choice Answer Sheet
Data Booklet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil
Write your name, class and student number on the answer sheet in the spaces provided.
Do not use staples, paper clips, highlighters, glue or correction fluid.

There are **forty** questions in this paper. Answer **all** questions. For each question there are four possible answers A, B, C and D.
Choose the one you consider correct and record your choice in soft pencil on the separate answer sheet.

Read the instructions on the answer sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.

This document consists of **13** printed pages.

[Turn over

1. Which of the following statements is correct?

   A. pressure is defined as mass per unit volume
   B. nanometer is equal to 1×10^{-6} m
   C. tension has a base unit equivalent of $kgms^{-2}$
   D. stress is a vector quantity

2. Which of the following equations is homogeneous?

A. $s = ut + \frac{1}{2} vt^2$	where	s – displacement, u, v – velocity, t - time
B. $p + \frac{1}{2} \rho v^2 = \text{constant}$		p – pressure, ρ - density, v – velocity
C. $Ft = m(v^2 - u^2)$		F – force, m - mass
D. $R = \frac{V^2}{I}$		R – resistance, V – potential difference, I - current

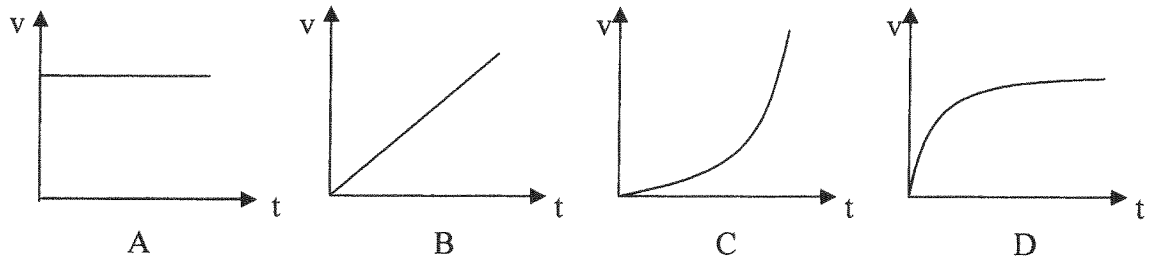
3. A student attempts to measure the volume of a cylindrical wire. The length measured is (20.0 ± 0.1) cm while the diameter of the wire is (0.185 ± 0.001) cm. What is the correct way to present the volume of the wire?

   A (0.54 ± 0.01) cm^3
   B (0.538 ± 0.006) cm^3
   C. (2.15 ± 0.04) cm^3
   D. (0.5376 ± 0.0001) cm^3

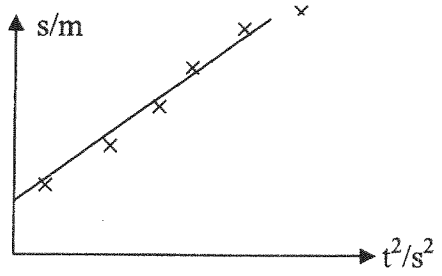
4. A car is traveling with a constant speed of 36 ms^{-1}. It takes 30 seconds to bring the car to a stop by applying the brakes. How far does the car travel during this time?

   A. 1080 m B. 810 m C. 540 m D. 270 m

5. Which of the graphs shows how the speed, v, of a ball falling from rest through air until it reaches terminal speed changes with time, t ?



6. In an experiment to determine the acceleration of free fall, g, a student measured the distance fallen and time taken for the fall. He obtained 6 different values of distance fallen and corresponding time without repeating the measurements. He plotted a graph of distance fallen, s, against square of time fallen, t^2.



The graph obtained is a straight line that does not pass through the origin. What could be the source of error in this experiment?

A. The measurements for each of the distance fallen and time are not repeated and averaged to plot the graph.
B. The range of distance fallen is too small.
C. The measuring tape has a zero error of 3 cm.
D. A graph of s versus t should have been plotted instead.

7. Which of the following statements is correct about the motion of an object that is thrown upwards vertically and returns to the same position? (assume the air resistance is negligible)

A. Acceleration is –ve while the object is moving up and +ve while it is moving down.
B. Initial velocity leaving the hand and the final velocity reaching the hand is the same.
C. The time to travel up is the same as the time to travel down.
D. The initial velocity is zero.

8. A stone is projected with an initial speed of 20 ms^{-1} into air at an angle 30° to the horizontal. It hits the ground at the same level with its initial launching position. How far is the stone from the launching point?

A. 35.3 m B. 40.8 m C. 70.6 m. D. 81.6 m

9. Which of the following situations is explained by Newton's 1st Law?

A. A gun recoil when a bullet is shot out from the barrel.
B. A helicopter lifts up from the ground when the blades rotate.
C. A passenger standing on a train is thrust forward when the train suddenly slows down.
D. A stone drops down with increasing speed when it is released.

10. A tennis ball has a mass of 0.100 kg. It travels with a speed of $20ms^{-1}$ when it hits a wall and rebounds in the opposite direction with a speed of 10 ms^{-1}. Determine the change in momentum of the tennis ball.

A. 1 Ns away from and normal to the wall.
B. 1 Ns towards and normal to the wall.
C. 3 Ns towards and normal to the wall.
D. 3 Ns away from and normal to the wall

11. A car of mass 250 kg is at rest at the slope of a hill which rises 10 m for every 100 m of the slope. When the handbrake of the car is released, determine the acceleration of the car if the car experiences a constant resistance of 60 N

A. 1.22 ms^{-2} B. 0.981 ms^{-2} C. 0.74 ms^{-2} D. 0.24 ms^{-2}

12. Two objects of mass m_A and m_B are moving towards each other with speeds u_A and u_B as shown in fig. 12. After collision, they move away from each other with speeds v_A and v_B.

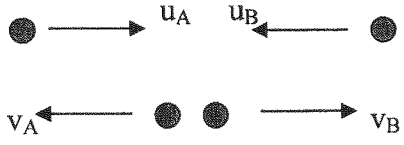


fig. 12

If the collision is perfectly elastic, which of the followings is incorrect?

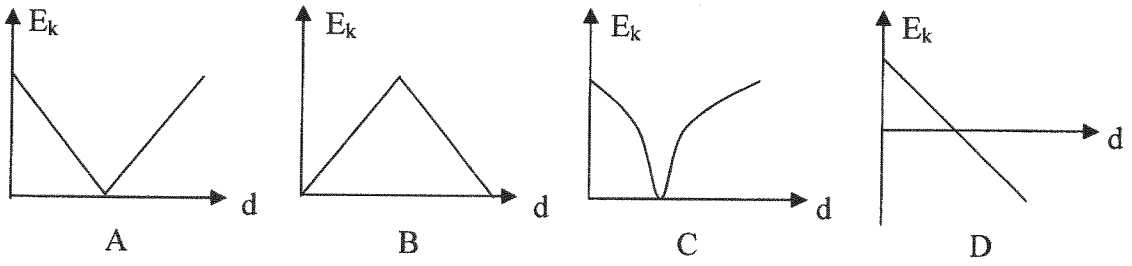
A. $m_Au_A - m_Bu_B = m_Bv_B - m_Av_A$

B. $\frac{1}{2} m_Au_A^2 + \frac{1}{2} m_Bu_B^2 = \frac{1}{2} m_Av_A^2 + \frac{1}{2} m_Bv_B^2$

C. $u_A - u_B = v_B - v_A$

D. $u_A + u_B = v_A + v_B$

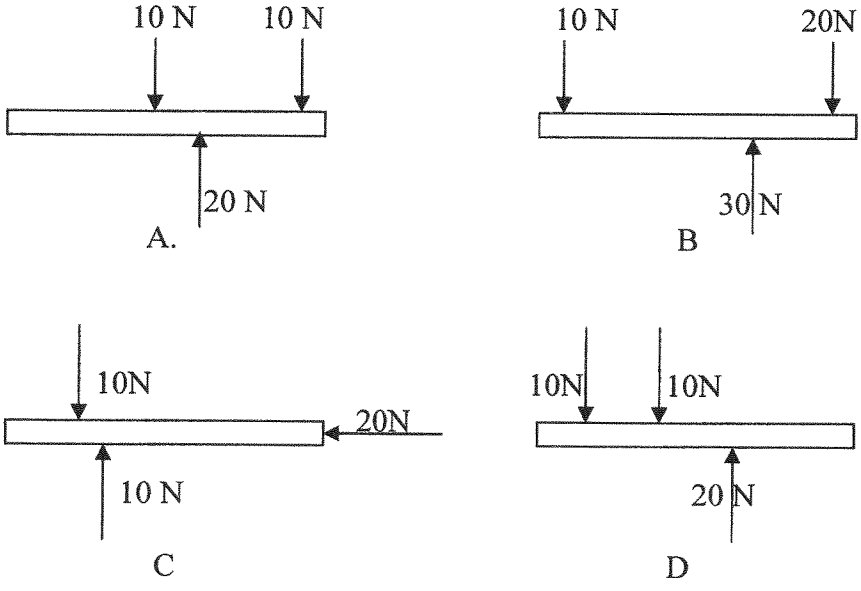
13. A spherical mass is projected vertically upwards with an initial speed and returns to its starting point. Which graph shows the variation of its kinetic energy with the displacement from the point of projection throughout the motion? (assume air resistance is negligible)



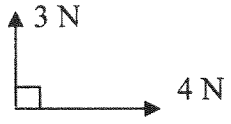
14. A crane used to lift up a pile driver has a power of 1000 W. The weight of the pile driver is 50 kg. If 20 % of the input energy is wasted as heat, how high is the pile driver lifted up vertically in 20 seconds at constant speed?

A. 32.6 m B. 40.8 m C. 8.2 m D. 1.6 m

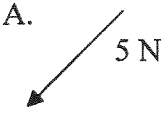
15. Three forces act on a system. Which of the followings show that the forces are in equilibrium?

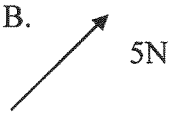


16. Two forces 3 N and 4 N acts on an object perpendicularly to each other as shown below.

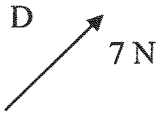


What force must be added so that the object is in equilibrium?

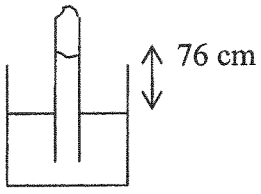
A. 

B. 

C 

D 

17. A manometer has a mercury length of 76.0 cm above the surface level in the beaker when placed in normal atmospheric pressure, P_o. If the atmospheric pressure decreases to 0.8 P_o, what will be the height of the mercury length? (assume the cross sectional area of the manometer tube is uniform and density of mercury is constant)

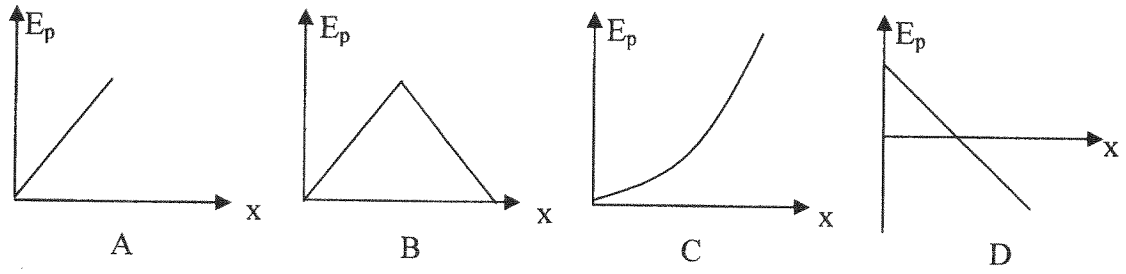


A. 15.2 cm B. 60.8 cm C. 76.0 cm D. 136.8 cm

18. The Young Modulus of a wire is 2.0×10^{11}Pa. It has a cross sectional area of 2×10^{-6} m^2 and original length of 2 m. If a load of 400 N produces a strain of 0.1 % within the proportional limit, calculate the energy stored in the stretch wire.

A. 0.10 J B. 0.20 J C. 0.40 J D. 0.80 J

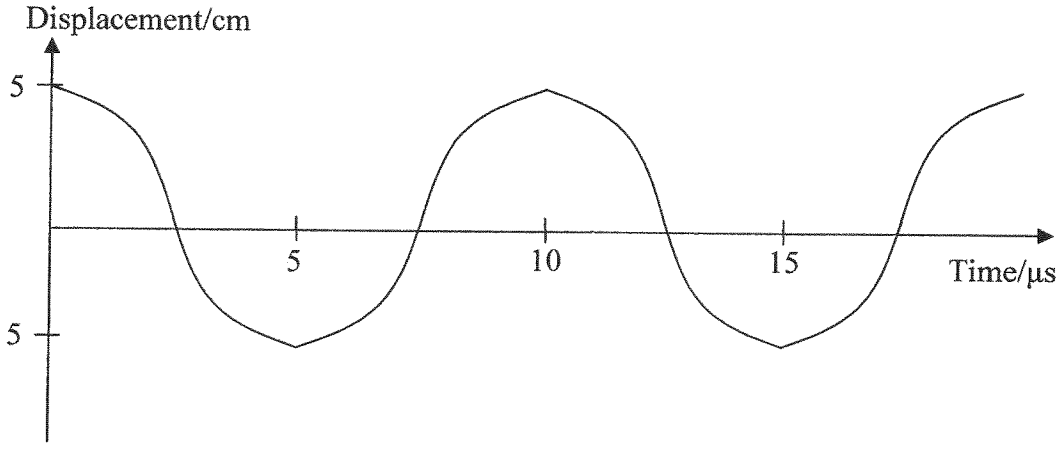
19. Which graph shows the variation of the elastic potential energy, E_p, stored in a stretched wire with the extension, x, within the proportional limit?



20. Which of the following explains why a concrete is brittle?

A. It does not undergo elastic deformation before fracture
B. It is made of long chains of molecules which are entangled
C. It has crystal imperfection known as edge dislocation that makes crack growth
D. It does not undergo plastic deformation before fracture.

21 The figure below represents a particular instant of a transverse wave travelling along a string with a speed of 500 ms^{-1}.



The wavelength is

A. 0.005 mm B. 0.100 mm C. 0.005 m D. 0.100 m

22. When blowing through open ended narrow tube, the fundamental frequency is f. Then, the narrow tube is sealed at one end and air with same speed is passed into the tube. The tone produced will have a frequency of

A. $f/3$ B. $f/2$ C. $2f$ D. $3f$

23. In Young Double slit experiment using a monochromatic light, a double slit is used to

A. produce a wave with same wavelength.

B. produce a constant phase link waves.

C. produce a wave with same speed.

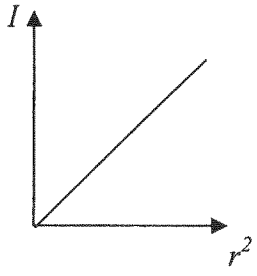
D. avoid other light source to interrupt the experiment.

24. The metre was defined in terms of the wavelength λ of the orange light emitted by excited atoms of Kryton – 86. Thus 1 metre = $n\lambda$, where n is the number of wavelengths in 1 metre of vacuum. What is the best value of n?

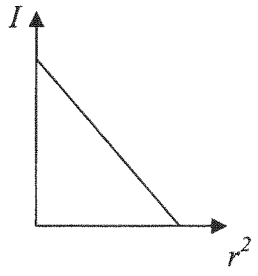
A. 1.43×10^4 B. 2.20×10^6 C. 3.30×10^{12} D. 5.80×10^{15}

25. Which graph best represents the way in which the intensity of wave I varies with the distance of the wave r from a point source?

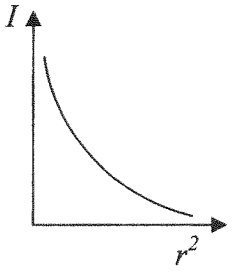
A.



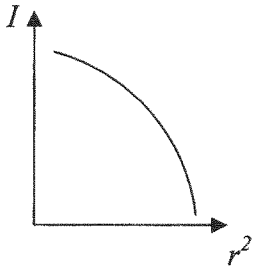
B.



C.



D.



26. Two continuous waves moving in opposite direction to each other meets at a point. If the waves have similar frequency but the sources of the waves are vibrating at anti phase to each other, what is the phase difference of these waves to produce a complete destructive interference at the meeting point?

A. $90^o, 180^o, 270^o, 360^o$ .....

B. $180^o, 540^o, 900^o, 1260^o$ .....

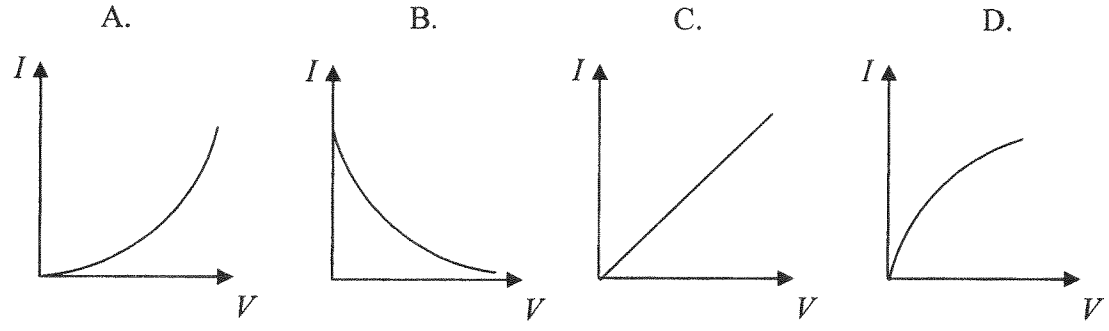
C. $180^o, 360^o, 540^o, 720^o$, ...

D. $360^o, 720^o, 1080^o, 1440^o$, ...

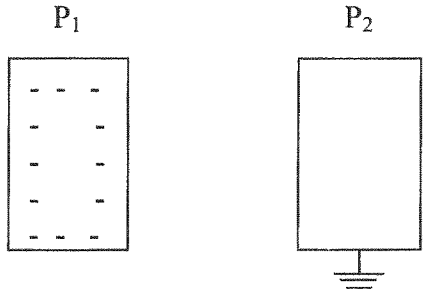
27. A parallel beam of white light is incident normally on a diffraction grating. It is noted that the second-order and third-order spectra partially overlap. What wavelength in the third-order spectrum will appear at the angle corresponding to a wavelength of 600 nm in the second-order spectrum?

A. 300 nm B. 400 nm C. 600 nm D. 900 nm

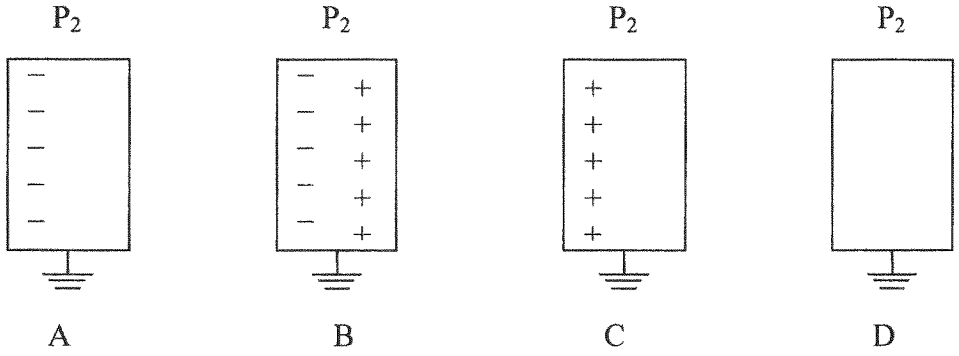
28. Which graph best represents the way in which the current I through a thermistor depends upon the potential difference, V across it?



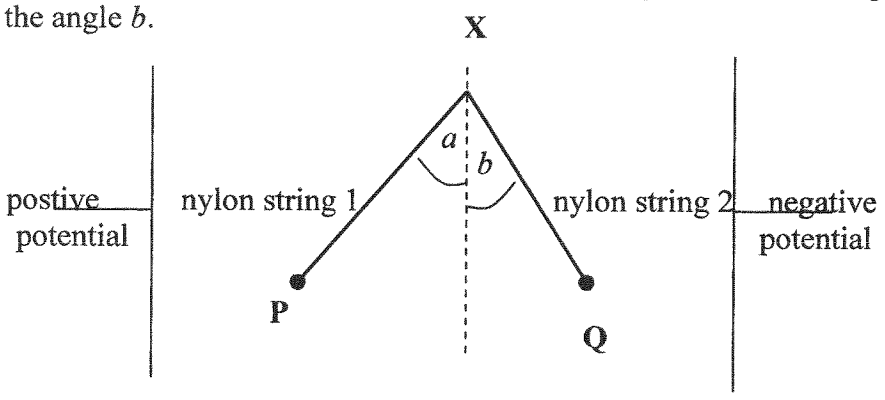
29. A negatively-charged plate P_1 is brought close to a coplanar and earthed metal plate P_2 which is initially uncharged.



Which diagram shows the induced charges on P_2? (note: the distribution of charge on P_2 is just a sketch, this is not an exact diagram)



30. The diagram shows two small charged spheres **P** and **Q** of equal mass which are hung by identical fine nylon threads from a fixed point **X**. They are far apart from each other so that any electric force on each other due to their charges is negligible. They is a uniform electric field between the plates. It is found that, in equilibrium, the angle *a* is greater than the angle *b*.



Which one of the following statement best represents the situation above.

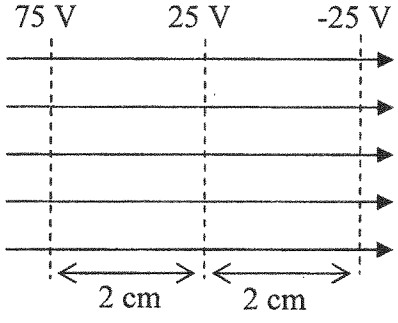
A. The charges on **P** and **Q** are both negative.

B. The tension of nylon string 1 is bigger than that of nylon string 2.

C. The charge on **P** is numerically smaller than the charge on **Q**.

D. Electric force acting on P is smaller than that acting on Q.

31. The diagram shows the direction of a uniform electric field in which the lines of equal potential are spaced 2.0 cm apart.



What is the value and direction of the electric force which is exerted on a charge – 10 μC when placed in the field?

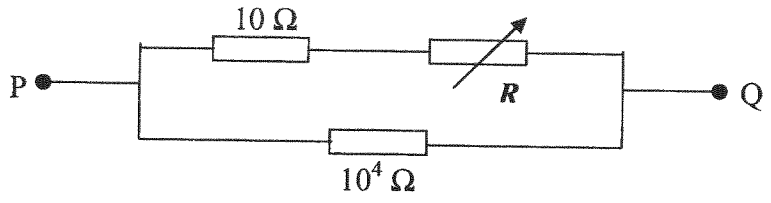
A. 2.5×10^{-5} N to the right

B. 2.5×10^{-5} N to the left

C. 2.5×10^{-2} N to the right

D. 2.5×10^{-2} N to the left

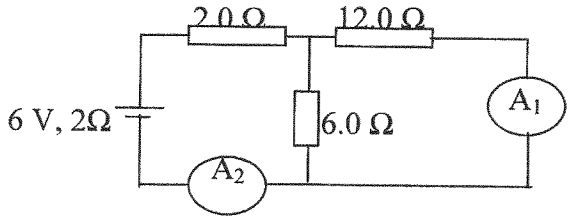
32. In the diagram below, the variable resistor ***R*** can be adjusted over its full range from zero to 10^3 Ω.



What are the approximate limits for the resistance between P and Q?

A. zero to 10^3 Ω B. zero to 10^4 Ω C. 10 to 10^3 Ω D. 10 to 10^4 Ω

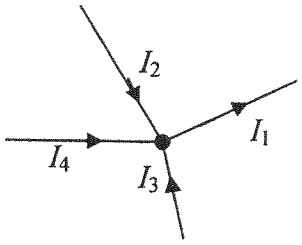
33. What is the ratio of the reading of ammeter A_1 to reading of ammeter A_2 in the figure below?



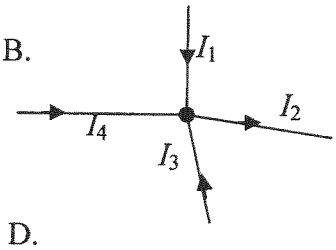
A. 1 : 3 B. 1 : 2 C. 3 : 1 D. 6 : 11

34. The diagrams below shows four different ways in which current I_1, I_2, I_3 and I_4 can combine at a junction. Which diagram shows $I_1 + I_2 = I_3 + I_4$.

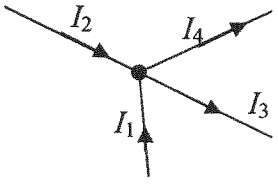
A.



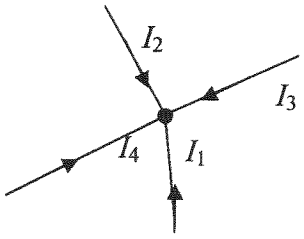
B.



C.



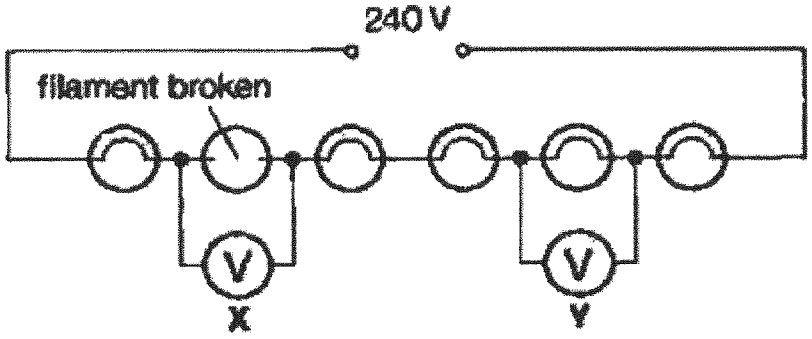
D.



35. What is the total number of electrons that flowed through a resistor of 5 Ω when a miliammeter connected in series to the resistor shows a decreasing reading from 5 mA to 2 mA in 6 seconds?

A. 7.50×10^{15} B. 1.13×10^{17} C. 1.31×10^{17} D. 1.88×10^{17}

36. A main circuit contains six similar bulbs connected in series. One of the bulbs has a broken filament. Voltmeters **X** and **Y** of infinite resistance are placed in the circuit as shown.



What are the voltmeter readings?

	X reading (V)	**Y** reading (V)
A	0	0
B	0	240
C	40	40
D	240	0

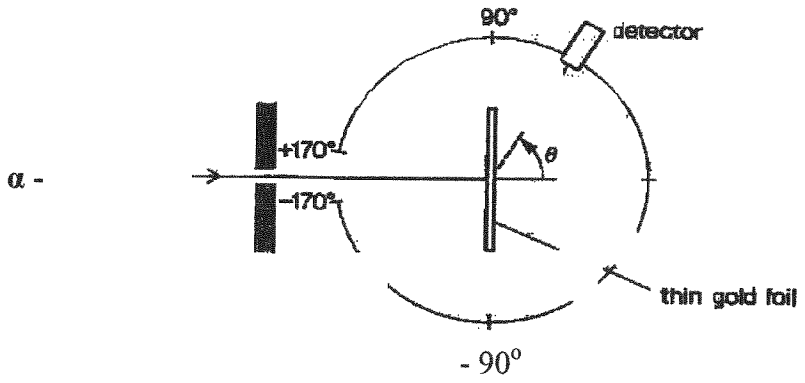
37. A generator produces 50 kW of power at a potential difference of 10 kV. The power is transmitted through cables of total length of 3 km. If the mean resistance of the cable is 5 Ω per kilometer, what is the total power lost in the cables?

A. 3.8 W B. 75 W C. 125 W D. 375 W

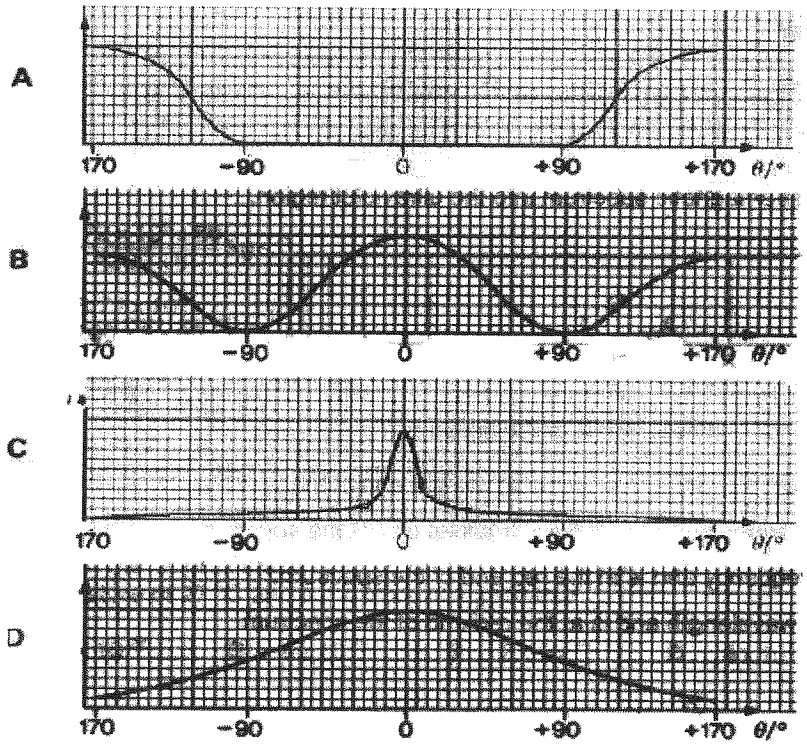
38. Which of this high speed particle will able to penetrate into the nucleus easier?

A. alpha nuclide B. neutron C. beta D. hydrogen nuclide

39. In repeating Rutherford's α-particles scattering experiment, a student used the apparatus shown, in a vacuum, to determine n the number of α-particles incident per unit time on a detector held at various angular positions θ.



Which graph best represents the variation of n with θ?



40. $^{238}_{92}U$ decays through a series of transformation to a stable nuclide. The particles emitted in the successive transformations are **α**, **β**, **β** and **α**. Which nuclide is not produced during this series of transformations?

A. $^{234}_{88}Ra$ B. $^{230}_{90}Th$ C. $^{234}_{91}Pa$ D. $^{234}_{92}U$