TAYLOR'S COLLEGE

Wisdom • Integrity • Excellence

CAMBRIDGE 'A' LEVEL PROGRAMME
AS TRIAL MARCH/APRIL 2005
(July 2004 Intake)

Monday **4 April 2005** **8.30 am – 9.30 am**

PHYSICS 9702/01

PAPER 1 **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 quantities possesses the same unit as impulse?

A	Potential energy	C	Momentum
B	Weight	D	Work

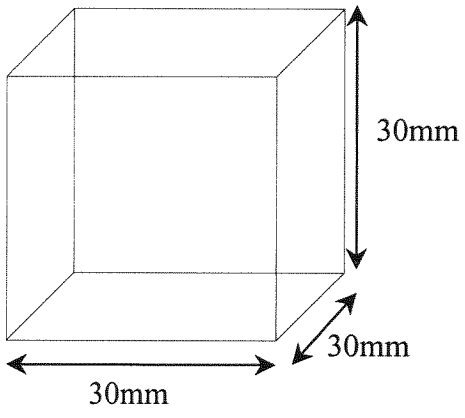
2. Which of the following quantities is a vector quantity

A	Weight	C	Distance
B	Temperature	D	Speed

3. What are the units of the constant c given in the equation $v^2 = cx + d$ if v is velocity, x is a distance variable and d is a constant?

A	ms^{-2}	C	s^{-2}
B	ms^{-1}	D	m^2s^{-2}

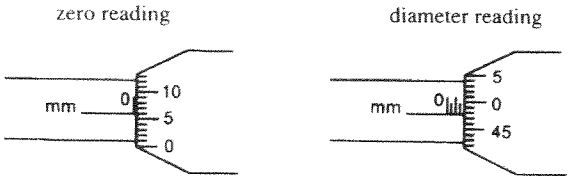
4. The dimensions of a cube are measured with vernier callipers.



The measured length of each side is 30 mm. If the vernier callipers can be read with an uncertainty of ± 0.1 mm, what does this give for the approximate uncertainty in the value of its volume?

A	$\frac{1}{27}\%$	C	1%
B	$\frac{3}{10}\%$	D	2%

5. The diameter of a steel ball is measured using a micrometer screw gauge. A student takes an initial zero reading and then a reading of the diameter.
The diagrams show enlargements of the screw gauge readings.



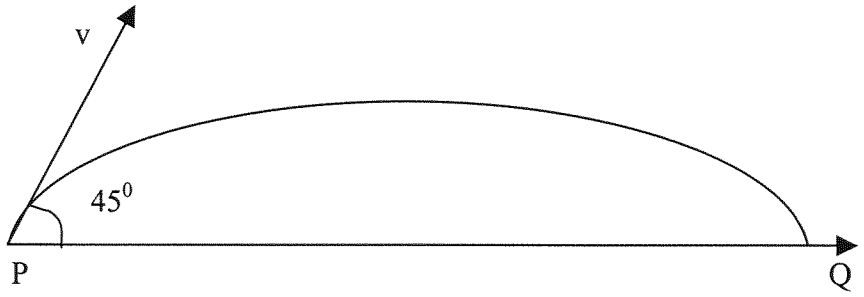
What is the diameter of the ball?

A	3.48 mm	C	1.92 mm
B	2.04 mm	D	1.42 mm

6. In a simple electrical circuit, the current in a resistor is measured as (2.50 ± 0.05) mA. The resistor is marked as having a value of 4.7 Ω ± 2%.
If these values were used to calculate the power dissipated in the resistor, what would be the percentage uncertainty in the value obtained?

A	2%	C	6%
B	4%	D	8%

7. A projectile of mass, m, is fired with a velocity, $v = 2u$ from point P.



Ignoring air resistance, find the change in the magnitude of momentum from point P to point Q.

A	zero	C	$2\sqrt{2}mu$
B	$\frac{1}{2}mu$	D	$2mu$

8. An object is projected vertically upwards from the earth's surface. The object achieves maximum height before falling to the earth. If air friction is negligible, which of the following statements is true of the object's motion in air?

   A The object's average velocity is zero
   B The object's linear momentum variation is zero
   C The object's velocity is not zero at maximum height
   D The object's acceleration is not constant along its entire motion

9. An object is projected at an angle to the horizon in a gravitational field. Its path is a parabola, PQRST. These points are the object's position after consecutively equal time intervals with T being the maximum height achieved. Displacements PQ, QR, RS and ST

   A are equal.
   B increases at a constant rate.
   C have the same horizontal components.
   D reduces at a constant rate.

10. A constant mass experiences a finite uniform acceleration if the resultant force acts on it

   A is zero
   B is directly proportional with its velocity
   C increases uniformly with regards to time
   D is constant but not zero

11. Which of the following statements is correct with respect to an *elastic collision*?

   A Momentum, kinetic energy and total energy are conserved.
   B Momentum and kinetic energy need not be conserved but total energy is.
   C Kinetic energy is conserved but the total momentum might be reduced, not increased.
   D Both kinetic energy and total energy are conserved but momentum is only conserved if the respective bodies are of equal mass.

12 An alpha particle (with a relative atomic mass of 4) collides head-on with another alpha particle which is stationary. If the collision is elastic, the final velocity of the first alpha particle is

   A the same as the initial velocity but in the opposite direction.
   B zero.
   C greater in magnitude than the initial velocity.
   D smaller in magnitude than the initial velocity.

13. Figure 13.1 shows two parallel forces F acting on a bar of length L pivoted at P. The forces give rise to a couple of torque M.

In figure 13.2, the lines of action of the forces are moved a distance $\frac{L}{4}$ to the left.

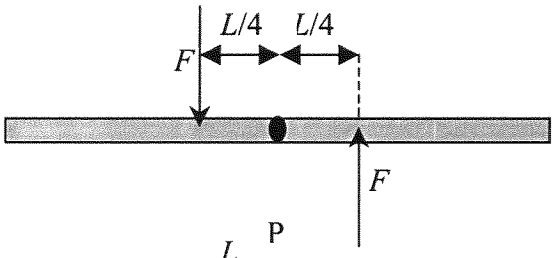


Figure 13.1

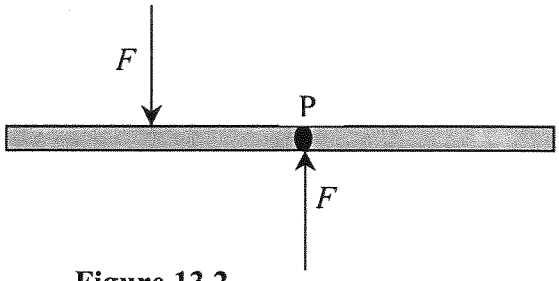
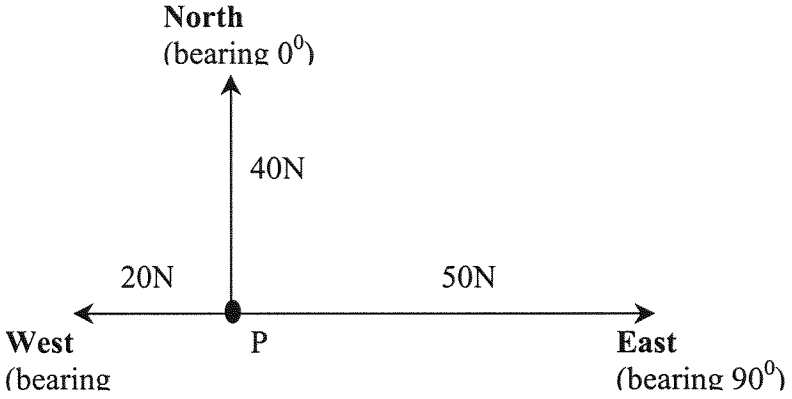


Figure 13.2

What is now the torque of the couple?

A	0	C	M
B	$\frac{M}{2}$	D	$2M$

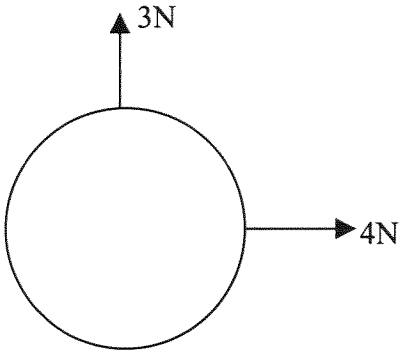
14. Three coplanar forces, of magnitude 20 N, 40 N and 50 N, act on a body at P in the direction shown in the diagram below.



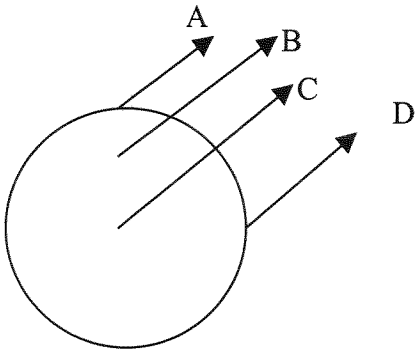
Which one of the following is the approximate bearing of the additional force required to maintain equilibrium?

A	37^0	C	217^0
B	127^0	D	233^0

15. Two forces act on a circular disc as shown in the diagram.



Which arrow best shows the line of action of the resultant force?



16. A lorry of mass 2 000 kg moving at a velocity of 72 km h^{-1} hits a stationary lorry of same mass. What is the total kinetic energy of both vehicles is they stick together after collision?

A	$1x10^5$ J	C	$3x10^5$ J
B	$2x10^5$ J	D	$4x10^5$ J

17. A car of mass 900 kg moves up an inclination of 15^0. The drag force F experienced by the car is given as

$$F_D = 200 + \frac{1}{2}v^2,$$

with v as the car's velocity in metres per second and F in Newton. If $v = 30$ ms^{-1}, the power needed by the car is

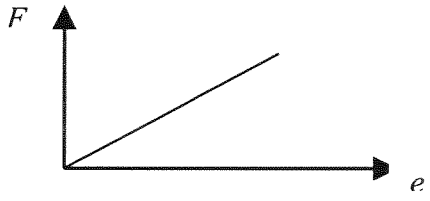
A	44 kW	C	88 kW
B	66 kW	D	99 kW

18. A body of mass, m, is projected at speed, v, at an angle, θ, to the horizontal so that it achieves a maximum height, H. Based on the principle of conservation of energy, the loss in kinetic energy at H is

A $\frac{1}{2}mv^2$ C $\frac{1}{2}mv^2 \sin^2\theta$

B $\frac{1}{2}mv^2 \sin\theta$ D $\frac{1}{2}mv^2 \cos^2\theta$

19. Figure below shows how the extension e of a wire varies with the force F applied. If the original length of the wire is l, its cross-sectional area A and its Young modulus is E, the gradient of the graph is

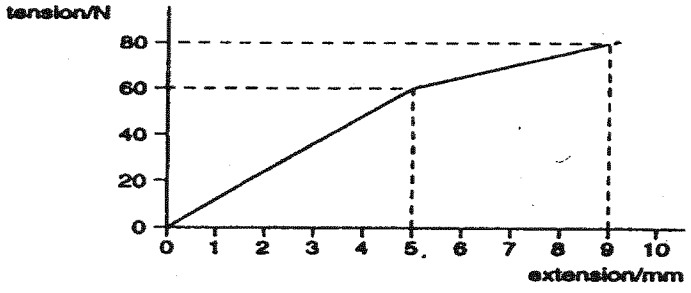


A $\frac{El}{A}$ B $\frac{EA^2}{l}$ C El^2A D $\frac{EA}{l}$

20. When stretched beyond its elastic limit, a metal rod such as steel

A becomes plastic B has no energy C obeys Hooke's law D becomes colder

21. A sample is placed in a tensile testing machine. It is extended by known amounts and the tension is measured.



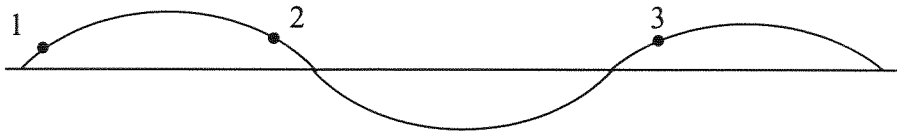
What is the work done on the sample when it is given a total extension of 9 mm ?

A 0.31 J B 0.36 J C 0.43 J D 0.72 J

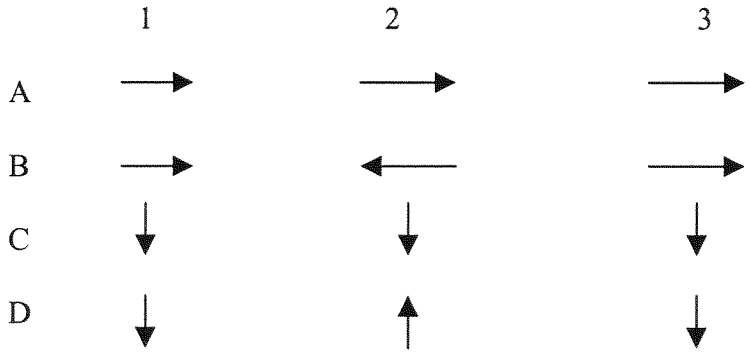
22. A steel wire of length 2 m and cross-sectional area 0.80×10^{-6} m^2 has a Young modulus of 2.0×10^{11} Pa. The upper end of the wire is fixed and a load of 4 N is tied at the other end. The extension in mm of the wire is

A 0.002 B 0.050 C 0.50 D 1.00

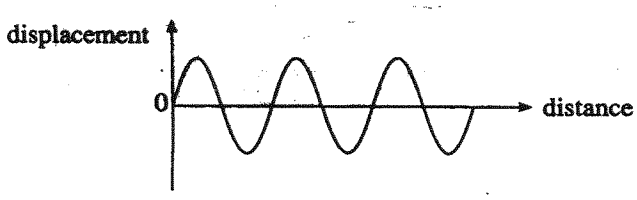
23. The diagram below shows on instantaneous position of a string as a transverse wave travels along it from left to right.



Which one of the following correctly shows the directions of the velocities of the points 1, 2, and 3 on the string ?



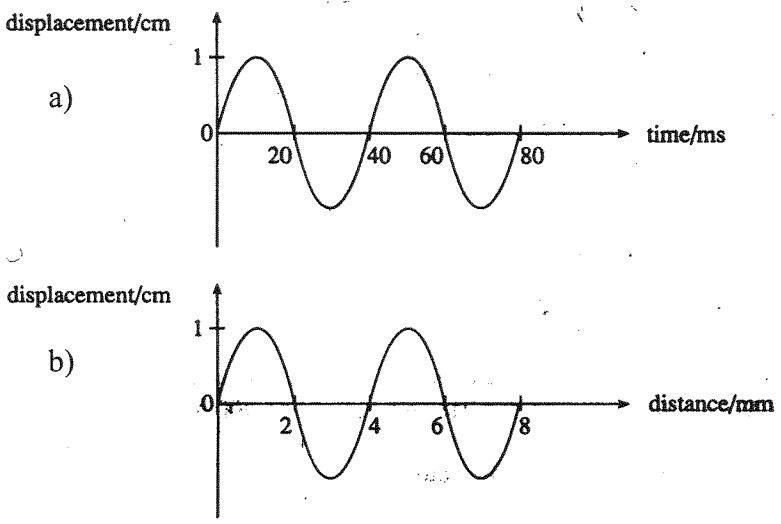
24. A wave moving from left to right in a medium is represented graphically by the figure below.



The graph actually shows the displacement of

A particles along the medium at a particular instant
B the particles at the source at the start of the wave motion
C any one particle along the medium at various instant
D particles along the medium at various instants.

25. Figure (a) and (b) below show the displacement-time and displacement-distance graphs respectively for a transverse wave.



What is the velocity of the wave.

A $0.05\ ms^{-1}$ B $0.10\ ms^{-1}$ C $0.16\ ms^{-1}$ D $0.20\ ms^{-1}$

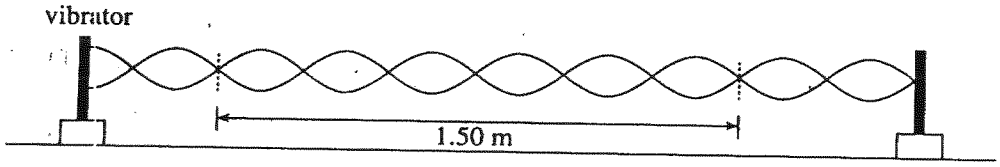
26. The principle of superposition states that

A the total displacement due to several waves is the sum of the displacements due to those waves acting individually
B two stationary waves superimpose to give two progressive waves
C a diffraction pattern consists of many interference patterns superimposed on one another.
D two progressive waves superimpose to give a stationary wave.

27. Which ones of the following groups of electromagnetic waves is in order of increasing frequency ?

A gamma rays, ultra-violet rays, radio waves.
B gamma rays, visible light, ultra-violetrays.
C visible light, infra-red radiation, microwaves.
D microwaves, ulra-violet rays, X-rays.

28. A vibrator produces a stationary wave on a stretched string as shown in the figure below. If the frequency of the vibrator is 20 Hz, what is the speed of the wave?

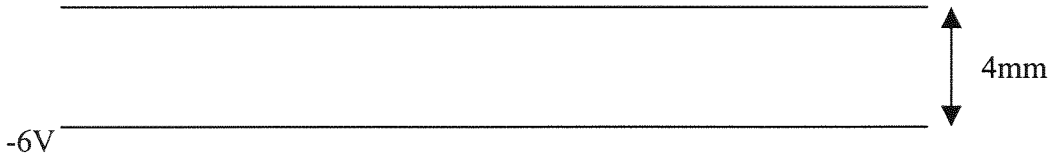


A 3.0 ms^{-1} B 10.0 ms^{-1} C 15.0 ms^{-1} D 22.5 ms^{-1}

29. Which one of the following provides experimental evidence that light is transverse rather than longitudinal, wave motion?

A Light is diffracted by a narrow slit.
B Two coherent light waves produce interference .
C The intensity of light from the point source varies inversely to the square of the distance from the source
D Light can be polarised.

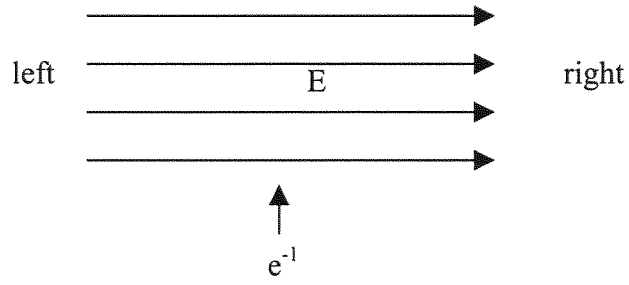
30. Two large horizontal metal plates are separated by 4 mm. The lower plate is at a potential of –6V.



What potential should be applied to the upper plate to create an electric field of strength 6000Vm^{-1} upwards in the space between space ?

A + 30V B – 22V C –30V D +22V

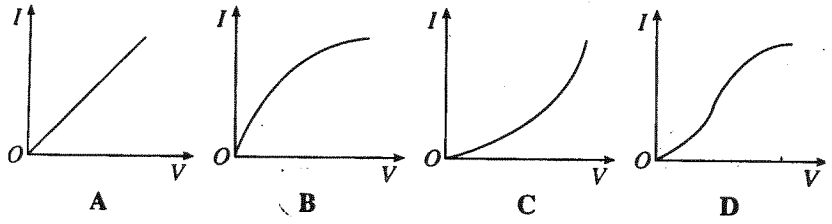
31. An electron is projected at right angle to a uniform electric field *E*.



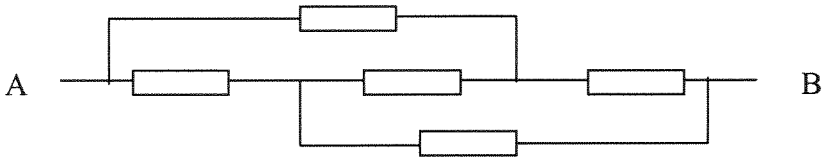
In the absence of other fields, in which direction is the electron deflected?

A into the plane of the paper
B out of the plane of the paper
C to the left
D to the right

32. The resistance of tungsten increases with increasing temperature, which of the following graphs shows correctly the relation between the current, *I*, flowing in the tungsten filament of an electric lamp and the potential difference, *V*, between its ends?



33. In the circuit shown in figure below, what is the effective resistance between the points A and B if the resistors are 10 Ω each?

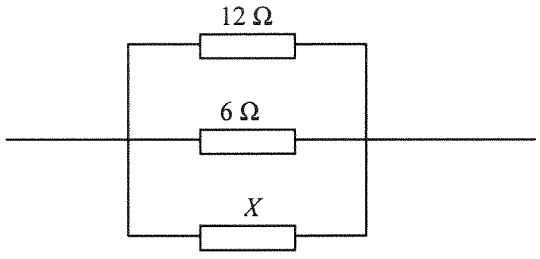


A 3.33 Ω B 30 Ω C 10 Ω D 50 Ω

34. Kirchhoff's two laws for electric circuit can be derived using conservation laws. On which conservation laws do Kirchhoff's laws depends?

	Kirchhoff's First Law	Kirchhoff's Second Law
A	Charge	Current
B	Charge	Energy
C	Current	Mass
D	Energy	Current

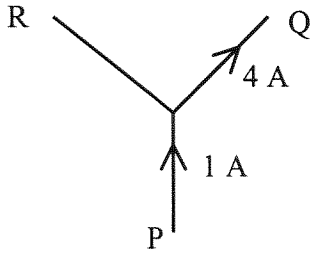
35. The diagram shows a parallel combination of three resistors. The total resistance of the combination is 2 Ω.



What is the resistance of resistor X?

A 0 Ω B 4 Ω C 6 Ω D 8 Ω

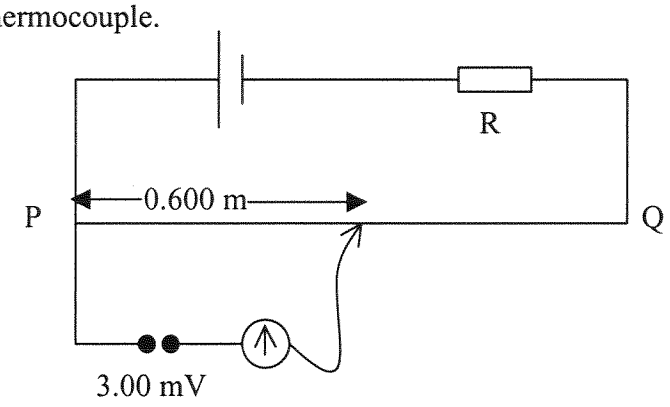
36. The diagram below shows a junction in a circuit where three wires P, Q and R meet. The currents in P and Q are 1A and 4 A respectively, in the directions shown.



How many coulombs of charge pass a given point in wire R in 5 seconds?

A 4 B 8 C 10 D 15

37. The diagram below shows a simple potentiometer circuit for measuring a small e.m.f. produced by a thermocouple.



The meter wire PQ has a resistance of 10 Ω and the driver cell has an e.m.f. of 4.5 V. If a balance point is obtained 0.600 m along PQ when measuring an e.m.f. of 3.00 mV, What is the value of resistance R in ohms?

A 8990 B 890 C 89 D 8.9

38. Which of the following particles when directed at an atom, penetrates its nucleus with most ease?

A Proton B α - particle C Electron D Neutron

39. The nuclide ${}^{210}_{81}X$ decays to became ${}^{A}_{84}Y$ in three successive radioactive decay processes. Each of the processes either involve a single alpha particle or a single beta particle. Hence the value of A is

A 198 B 202 C 206 D 210

40. An event on a distant star causes the emission of a burst of radiation containing β-particles, γ rays and light. Which one of the following statements about the order in which these radiation arrive at, the Earth is correct?

A The light would arrive first.
B The γ rays would arrive first, then light and followed by β-particles.
C The light and the γ rays would arrive together ahead of β-particles.
D All three would arrive together.