CAMBRIDGE 'A' LEVEL PROGRAMME

AS TRIAL EXAMINATION AUGUST/SEPTEMBER 2007

(Jan/March 2008 Intake)

Thursday 4 September 2008

8.30 am – 9.30 am

PHYSICS ***9702/01***

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 12 printed pages.

© Taylor's College Subang Jaya 2008

[Turn over

UNIVERSITY COLLEGE

1 Convert 1.5 g cm^{-3} to base units.

A 15 kgm^{-3} **B** 150 kgm^{-3} **C** 1500 kgm^{-3} **D** 15000 kgm^{-3}

2 In the equation $P = kQ + nR$, where P is pressure, k is unitless constant and n is a constant with a unit of per metre, which of the following statement is **incorrect**.

A Q has a unit same has P

B Q and R have the same unit

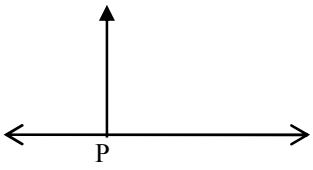
C The product of nR have the same unit as Q

D The unit for R is kgs^{-2}

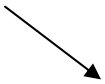
3 Forces of 4 N and 6 N act at a point. Which one of the following could not be the magnitude of their resultant?

A 1 N **B** 6 N **C** 8 N **D** 10 N

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



A

B 

C 

D 

5 Which of the following statements about errors is correct ?

A Zero error is random error.

B Systematic error can be due to instruments which are not sensitive.

C Random errors can be reduced by taking repeated readings and averaging their values.

D Systematic errors cause the readings scattered on both sides of the actual value.

6 The resistance ***X*** of an unknown resistor is measured by finding the potential difference across it and the current through it. If the readings of the potential difference and current are (2.00 ± 0.02) V and (5.3 ± 0.1) mA respectively, the resistance ***X*** should be quoted as

A (377.4 ± 0.1) Ω

B (380 ± 10) Ω

C (377.36 ± 0.01) Ω

D (377.358 ± 0.001) Ω

7 What is the rate of change of momentum when a force of 4 N acts on a mass of 2 kg for a time of 2 s ?

A 1 $kgms^{-2}$ **B** 2 $kgms^{-2}$ **C** 4 $kgms^{-2}$ **D** 8 $kgms^{-2}$

8

A projectile of mass, *m* is fired with velocity *u* from a point ***A***. Neglecting air resistance, the magnitude of the change in momentum between leaving ***A*** and arriving at ***B*** is

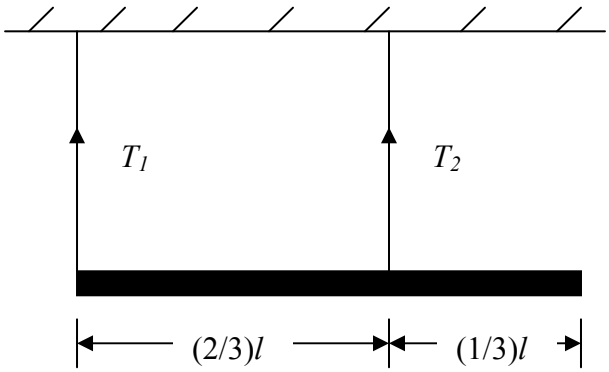
A $\sqrt{3}\,mu$ **B** mu **C** zero **D** $\frac{mu}{2}$

9 A stationary radioactive nucleus decays leaving behind a daughter nucleus of mass M_1 and a particle of mass M_2. The daughter nucleus and the particle move off in opposite directions with speeds v_1 and v_2 respectively. What is the ratio of

$$\frac{\text{Kinetic energy of particle}}{\text{Kinetic energy of daughter nucleus}} \; ?$$

A $\frac{M_2}{M_1 + M_2}$ **B** $\frac{M_1}{M_1 + M_2}$ **C** $\frac{M_1}{M_2}$ **D** $\frac{M_2}{M_1}$

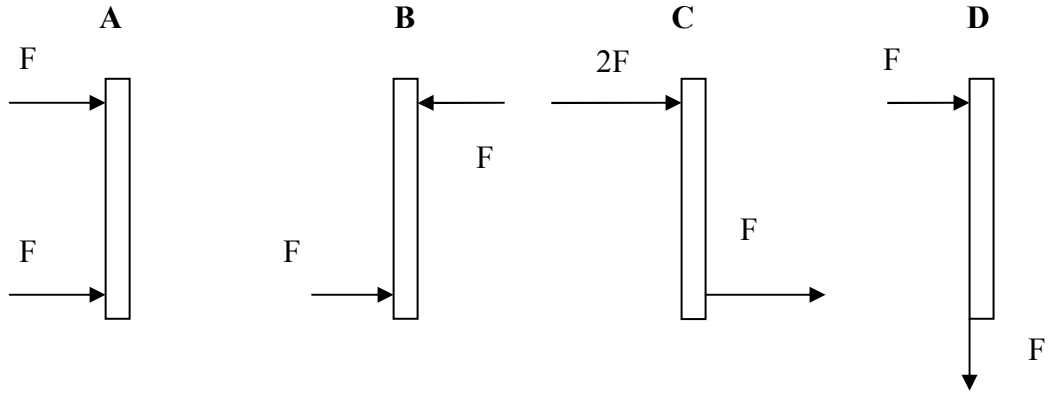
10 A heavy uniform beam of length l is supported by two vertical cords as shown in the diagram below.



What is the ratio T_1 / T_2 of the tensions in these cords ?

A 1/3 **B** 1/2 **C** 2/3 **D** 2/1

11 Which of the following pairs of forces, acting on a rod, constitutes a couple?



12 An object of weight 100 N registers a value of 80 N by a spring balance when the lift is moving. Which of the following situations is possible?

A The lift is decelerating and moving upwards.

B The lift is moving at constant velocity.

C The lift is decelerating and moving downwards.

D The lift is accelerating and moving upwards.

13 Two springs P and Q both obey Hooke's law. They have spring constants $2k$ and k respectively. The springs are stretched separately by a number of slotted weights so that the extension produced is the same for each spring. The work done in stretching spring P is W_P and the work done in stretching spring Q is W_Q.

How is W_P related to W_Q ?

A $W_P = ¼\ W_Q$

B $W_P = ½\ W_Q$

C $W_P = 2\ W_Q$

D $W_P = 4W_Q$

14 An object accelerates uniformly when the resultant force acting on it

A is zero

B is proportional to the displacement from a fixed point

C is constant but not zero

D increases uniformly with respect to time

15 A car of mass m has an engine which delivers a constant power P. What is the minimum time it takes to accelerate from rest to a speed v?

A $\frac{mv}{P}$ **B** $\frac{P}{mv}$ **C** $\frac{mv^2}{2P}$ **D** $\frac{2P}{mv^2}$

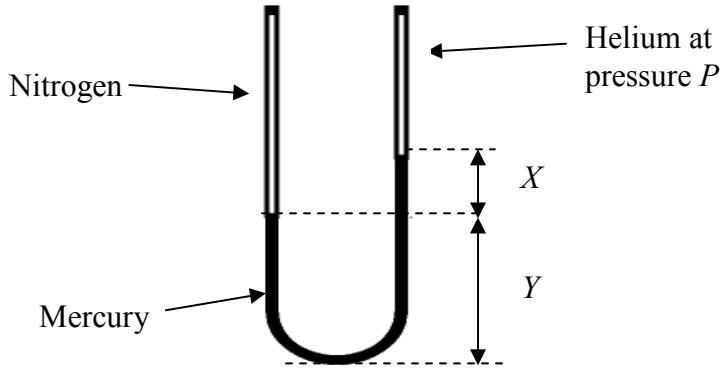
16 A body of mass, m, moves at constant speed, v, for a distance, s, against a constant force, F. What is the power required to sustain this motion?

A mv **B** $½\ mv^2$ **C** $½\ Fs$ **D** Fv

17 A crate is pushed 10 m along a horizontal surface by a force of 80 N. The frictional force opposing the motion is 60 N. How much of the work done is converted into thermal energy and how much into kinetic energy of the crate?

	Thermal energy /J	Kinetic energy/ J
A	200	600
B	200	800
C	600	200
D	600	800

18



A sealed U-tube contains nitrogen in one arm and helium at pressure P at the other arm. The gases are separated by mercury of density ρ with dimensions as shown in the figure above. The acceleration of free fall is g**.** What is the pressure of the nitrogen contained in the tube?

A P **B** $P - X\rho g$ **C** $P + X\rho g$ **D** $P + (X+Y)\rho g$

19 Which statement concerning the evaporation and boiling of a liquid is true?

A Boiling always occurs at a higher temperature than evaporation.

B Evaporation and boiling are unaffected by changes in the surface area of the liquid.

C Evaporation occurs at any temperature whereas the boiling point depends on the external pressure.

D Evaporation results in the loss of the most energetic molecules from a liquid whereas in boiling, all molecules have the same energy.

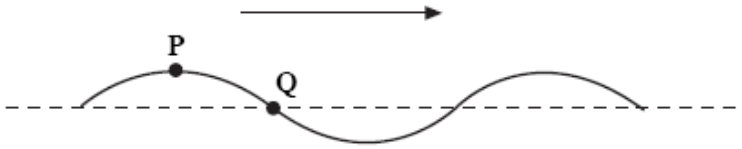
20 A wire that obeys Hooke's law is of length 20 cm when it is in equilibrium under a tension 2.0×10^4 N. If the length increases to 20.2 cm when the tension is increased to 3.0×10^4 N, the energy stored in the wire during the process is

A 20 J **B** 50 J **C** 100 J **D** 5000 J

21 A steel wire of length l and diameter d is found to have a strain of 6.0×10^{-4} when supporting a certain load. If this wire is replaced by a second steel wire of the same length but of diameter d/2, the strain will be

A 2.4×10^{-3} **B** 1.2×10^{-3} **C** 3.0×10^{-4} **D** 6.0×10^{-4}

22 The diagram shows a snapshot of a wave on a rope travelling from left to right.



At the instant shown, point P is at maximum displacement and point Q is at zero displacement. Which one of the following lines, in the table correctly describes the motion of P and Q in the next half-cycle?

	P	Q
A	falls then rises	Rises
B	falls then rises	rises then falls
C	falls	falls
D	falls	rises then falls

23 Two points on a progressive wave differ in phase by $\pi/4$. The distance between them is 0.5 m, and the frequency of the oscillation is 10 Hz. What is the minimum speed of the wave?

A 0.2 m s^{-1} **B** 10 ms^{-1} **C** 20 ms^{-1} **D** 40 ms^{-1}

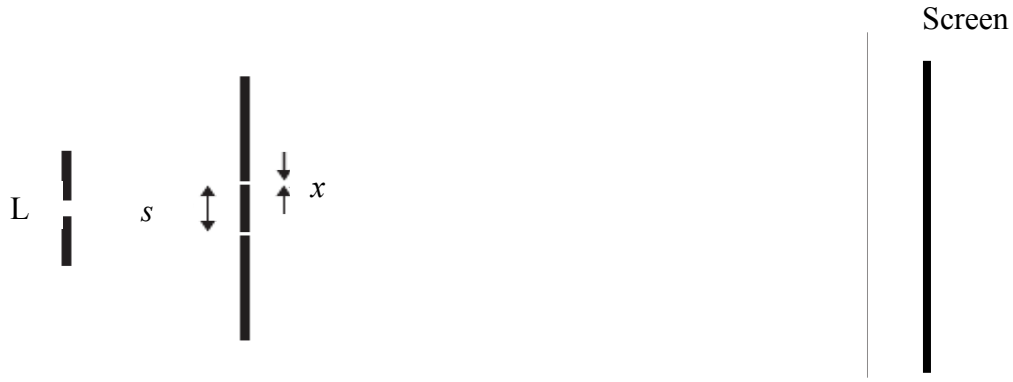
24 Using a diffraction grating with light of wavelength 500 nm incident normally, a student found the second order diffracted maxima in a direction at 30° to the central bright fringe. What is the number of lines per meter on the grating?

A 2×10^4 **B** 2×10^5 **C** 4×10^5 **D** 5×10^5

25 Which line in the table gives a correct difference between a progressive wave and a stationary wave?

	Progressive wave	Stationary wave
A	all the particles vibrate	some of the particles do not vibrate
B	none of the particles vibrate with the same amplitude	all the particles vibrate with the with the same amplitude
C	all the particles vibrate in phase with each other	none of the particles vibrate in phase with each other
D	some of the particles do not vibrate	all the particles vibrate in phase with each other

26 In a double slit system used to produce interference fringes, the separation of the slits is *s* and the width of each slit is *x*. **L** is a source of monochromatic light.



Which one of the following changes would decrease the separation of the fringes seen on the screen?

A moving the screen closer to the double slits

B decreasing the width, *x*, of each slit, but keeping *s* constant

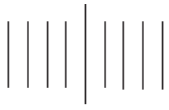
C decreasing the separation, *s*, of the slits

D exchanging L for a monochromatic source of longer wavelength

27

The diagram above shows the first four diffraction orders on each side of the zero order when a beam of monochromatic light is incident normally on a diffraction grating of slit separation *d*. All the angles of diffraction are small. Which one of the patterns, drawn on the same scale, is obtained when the grating is exchanged for one with a slit separation *d*/2?

A



B

C

D

28 What may be used to produce stationary waves?

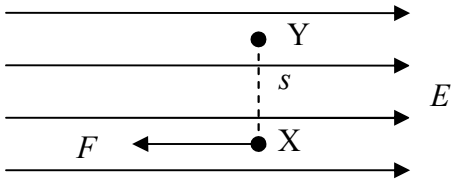
A blowing air over the top of an empty bottle

B making a loud sound near a mountain

C passing monochromatic light through a double slit

D passing water waves through a narrow slit

29 A negatively charged particle experiences a force *F* when placed at point X in uniform electric field strength of *E*. The charge is then moved from point X to point Y**.** Distance *s* is shown on the diagram.



What is change in the kinetic energy of the charge?

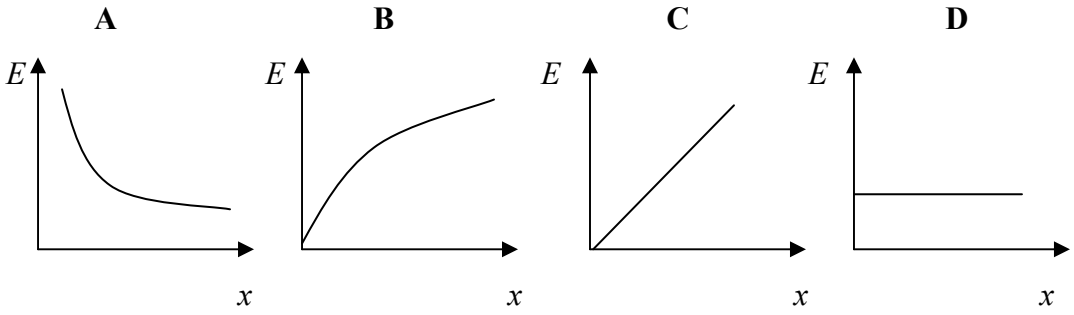
A Zero

B Decreases by *Fs*

C Decreases by *Es*

D Increases by *Fs*

30 Two parallel conducting plates are connected to a battery, one plate to the positive terminal and the other plate to the negative. The plate separation is gradually increased, the plates remaining connected to the battery.
Which graph shows how the electric field *E* between the plates depends on the plate separation *x*?



31 An electron and a proton enter the space between two parallel charged plates with the same velocity. The electron is deflected towards the positive plate and the proton deflected towards negative plate. Which of the statement below is true?

A Both have the same deflection angle as the particles have same magnitude of charge.

B Electron is deflected more than the proton as it has greater charge.

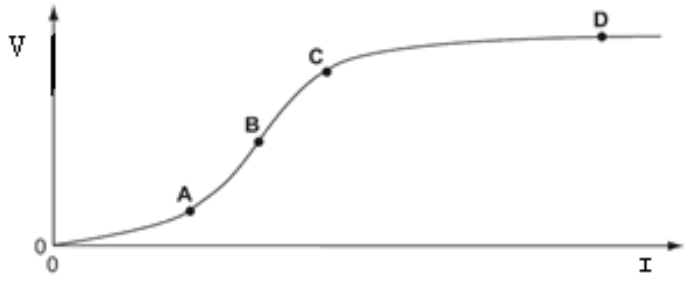
C Proton is deflected less than the electron as it has greater mass.

D Electron is deflected more as it experiences a greater force than the proton.

32 A 10 Ω resistor is connected is series with a rheostat and a power supply. A voltmeter with high resistance is connected across the 10 Ω resistor. The rheostat's resistance is decreased uniformly in 5 s. The reading of the voltmeter increases from 5 V to 15 V during this duration. What is the total charge that has flowed through the rheostat during this time?

A 2 C **B** 5 C **C** 8 C **D** 12 C

33 The graph shows how the potential difference *V* through a conducting liquid varies with the electric current I across it. At which point on the graph does the liquid have the smallest resistance?

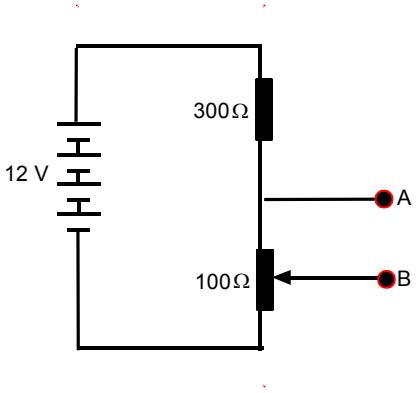


A **B** **C** **D**

34 Two wires X and Y have the same length. Diameter of X is twice as wire Y. When the wires are tested, both show the same resistance. What is the ratio of the resistivity of X to the resistivity of Y?

A ¼ **B** ½ **C** 2 **D** 4

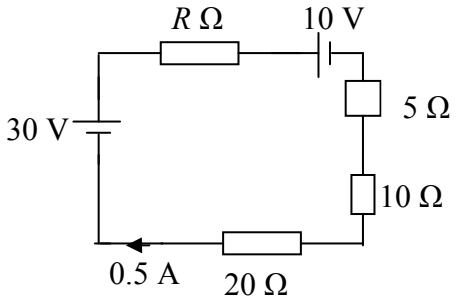
35 B is the wiper of a 100 Ω rotary potentiometer.



What is the range of the potential difference that can be tapped off between A and B?

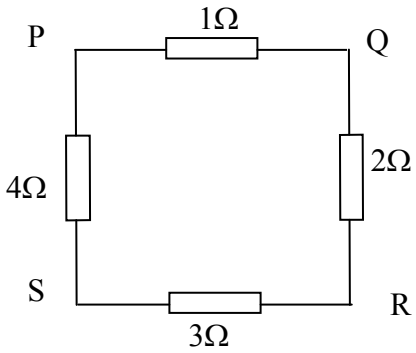
A 0 – 3 V **B** 0 – 12 V **C** 3 – 12 V **D** 9 – 12 V

36 What is the power dissipated in the resistor *R* if the current in the circuit is 0.5 A



A 0.75 W **B** 1.25 W **C** 1.63 W **D** 3.67 W

37 Four resistors are connected as shown.



Between which two points does the maximum resistance of the combination occur?

A P and Q **B** Q and S **C** R and S **D** S and P

38 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 radiations 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

39 A radioactive source is placed in front of a G-M tube connected to a counter. Various absorbers are placed between the source and the G-M tube and the count-rate recorded. When the radioactive source is removed the G-M tube registers an average reading of 215 count/min^{-1}. The following results were obtained.

Absorber	Count/min^{-1}
No absorber	711
A sheet of paper	706
2 mm thick aluminium sheet	506
25 mm thick lead block	218

It can be deduced from these results that the radiations emitted by source is/are

A β-rays only **B** α-,β- and γ rays **C** α- and γ rays only **D** β- and α rays

40 In a nuclear reaction all below are conserved except

A nucleon number

B momentum

C neutron number

D proton number