2005

PRELIMINARY COURSE
FINAL EXAMINATION

PHYSICS

2 UNIT

General Instructions

- Assessment Task No. 5
- Weighting – 30%
- Reading time – 5 minutes
- Working time – 2 hours
- Physics Formulae & Data Sheets are attached to the back of this paper.
- The Multiple Choice Answer Sheet is attached to the back of this paper. Carefully tear it off ready for use and write your name on it.

This examination has TWO parts.

Part A **Multiple Choice**

Total marks (**15**)

- Attempt ALL Questions 1 to 15
- Mark your answers on the Multiple Choice Answer Sheet provided.
- Allow about 25 minutes for this part.

Part B **Extended Answer Questions**

Total marks (55)

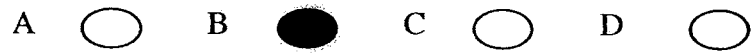
- Attempt ALL Questions 16 to 26
- Write your answers in the spaces provided in this Exam Paper.
- Allow about 1 hour and 35 minutes for this part.

Part A – 15 marks
Attempt Questions 1-15
Allow about 25 minutes for this part

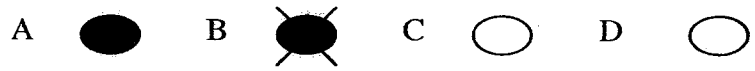
Use the multiple-choice answer sheet.

Select the alternative A,B,C or D that best answers the question. Fill in the response oval completely.

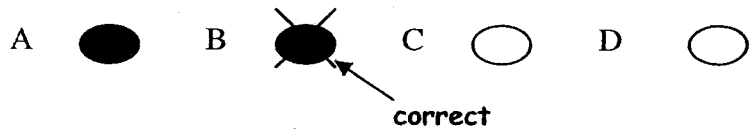
Sample: 2 + 4 = (A) 2 (B) 6 (C) 8 (D) 9



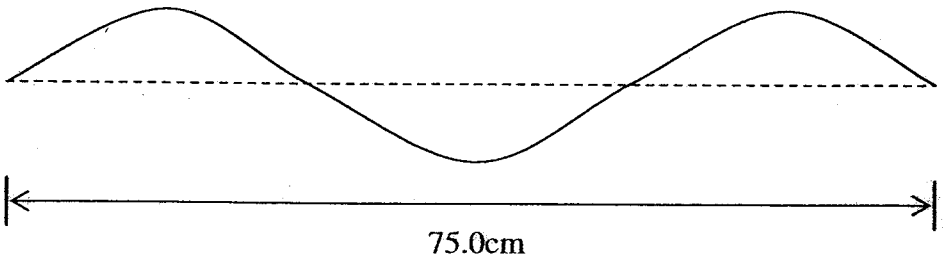
If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.



If you change your mind and have crossed out what you consider to be the correct answer, then indicate the correct answer by writing the word **correct** and drawing an arrow as follows.



1 A wave travelling in a guitar string was photographed. The results are represented in the diagram below:



The frequency of the note produced by the guitar string was 540Hz.

The velocity of the wave in the guitar string was:

(A) $135ms^{-1}$

(B) $202.5ms^{-1}$

(C) $270ms^{-1}$

(D) $405ms^{-1}$

2 The Earth's atmosphere is most effective in shielding the Earth's surface from which wavebands of the electromagnetic spectrum?

(A) gamma rays, UV, radio

(B) gamma rays, UV, microwave

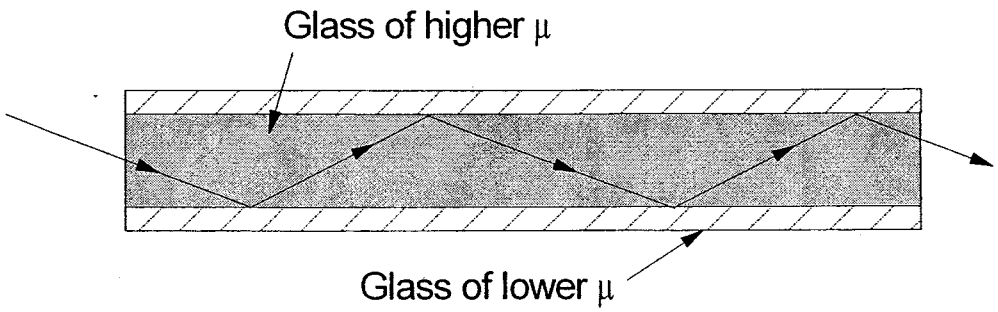
(C) gamma rays, X-rays, UV

(D) X-rays, UV, infra-red

3. The law which best explains why momentum is conserved in a collision is:

A Newton's 1st Law
B Newton's 2nd Law
C Newton's 3rd Law
D Newton's Law of Universal Gravitation

4. The diagram below shows light moving through an optical fibre.



Optical fibres work using the phenomenon of **total internal reflection of light**. For total internal reflection of light to occur, the light must strike the boundary between the two glass media with:

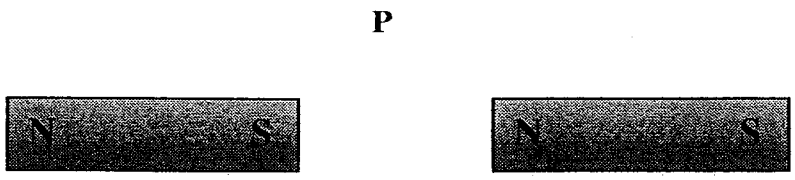
A. an angle of incidence less than the critical angle

B. an angle of incidence greater than the critical angle

C. an angle of reflection greater than the critical angle

D. an angle of reflection equal to 90^{o}

5 Two bar magnets were arranged as shown.



When the north pole of a third bar magnet was placed at point "P", the force experienced by the third magnet was in which direction?

(A) up the page

(B) down the page

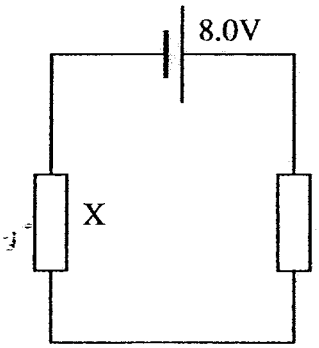
(C) to the right

(D) to the left

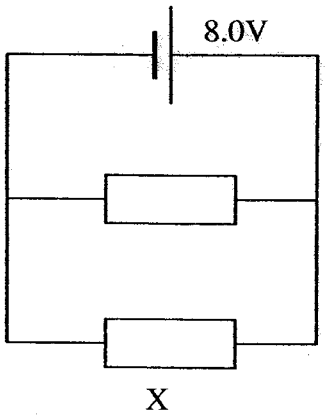
6 Several circuits were constructed using identical 4.0 ohm resistors.

In which circuit has the resistor labelled "X" the most current flowing through it?

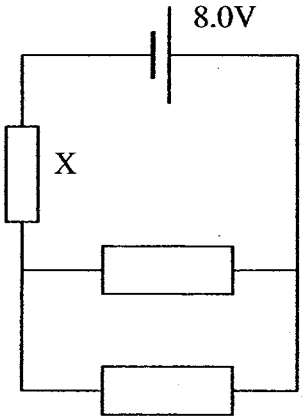
(A)



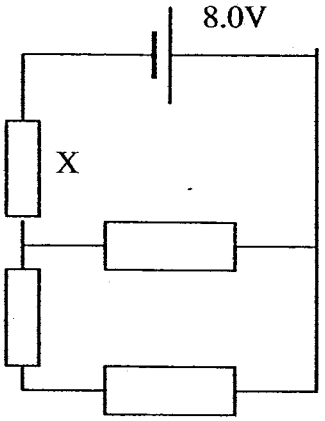
(B)



(C)

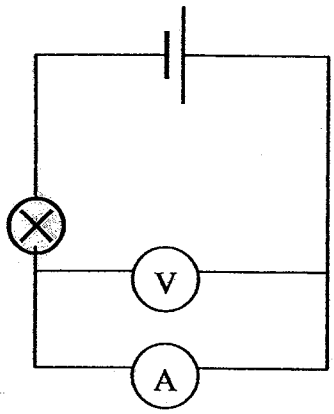


(D)

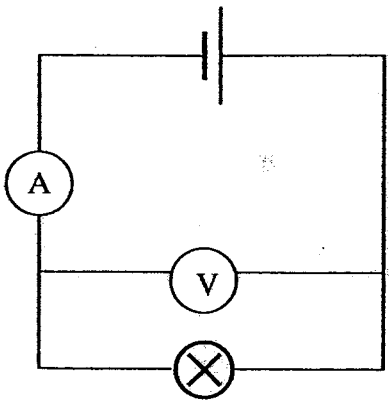


7 In which of the following circuits will the potential difference across the globe and the current through the globe be measured correctly?

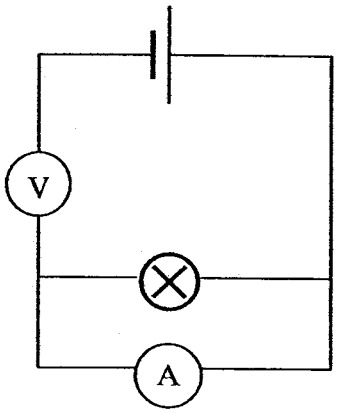
(A)



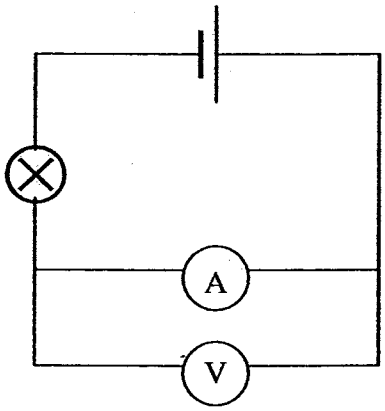
(B)



(C)



(D)



8 A force of 10N directed towards the centre of a circular track was required to keep a toy car moving with a constant speed v. When the speed of the same car on the same track is increased to $3v$, the force needed to keep the car on the track becomes:

(A) 30N

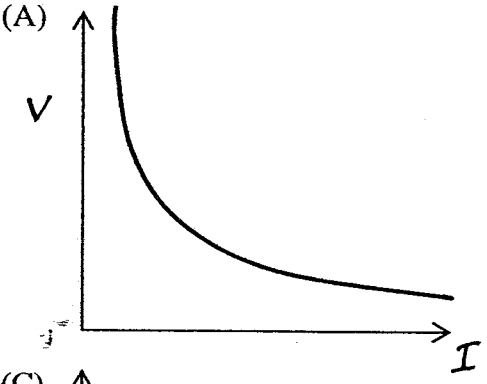
(B) 60N

(C) 90N

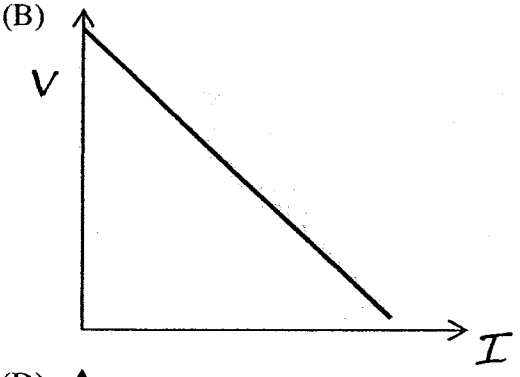
(D) 120N

9 An ohmic resistance had the potential difference across it and the current through it measured for several different voltages. When the results were plotted as a V versus I graph, the shape of the graph would most closely resemble:

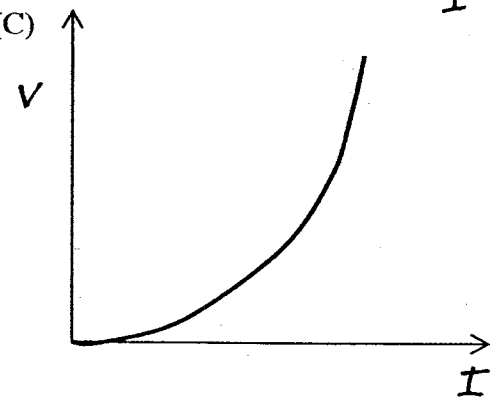
(A)



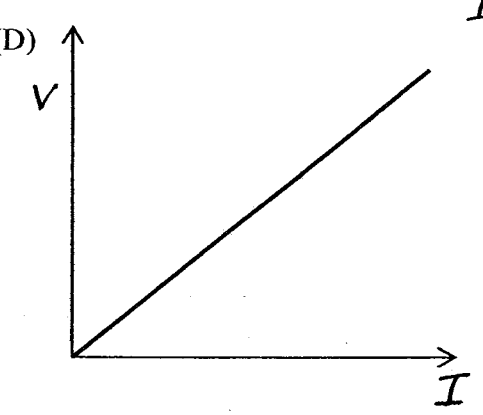
(B)



(C)



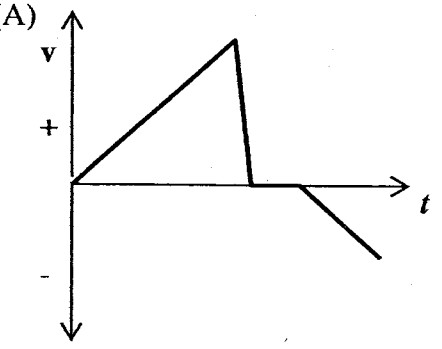
(D)



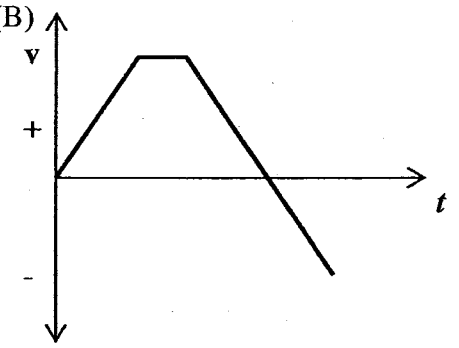
10 A car began accelerating from rest and then stopped quickly. After waiting a short time, it then moved off again in the opposite direction.

Which graph of velocity versus time could this car have made?

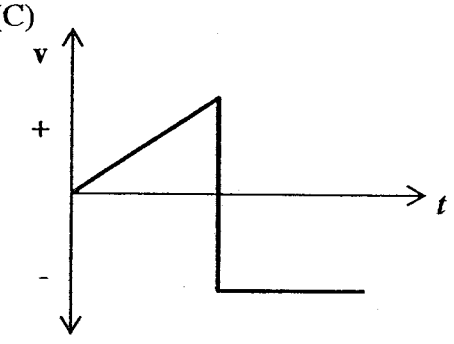
(A)



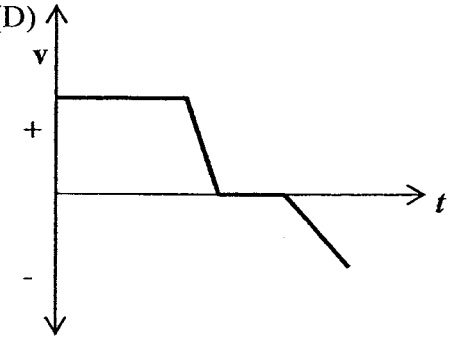
(B)



(C)



(D)



11. When worn correctly, seat belts have the effect of:

A. Decreasing the occupant's kinetic energy faster.

B. Decreasing the occupant's kinetic energy more slowly.

C. Increasing the impulse on the occupant.

D. Decreasing the impulse on the occupant.

12 The Copernicus model of the universe improved on earlier models especially in explaining which aspect of the universe?

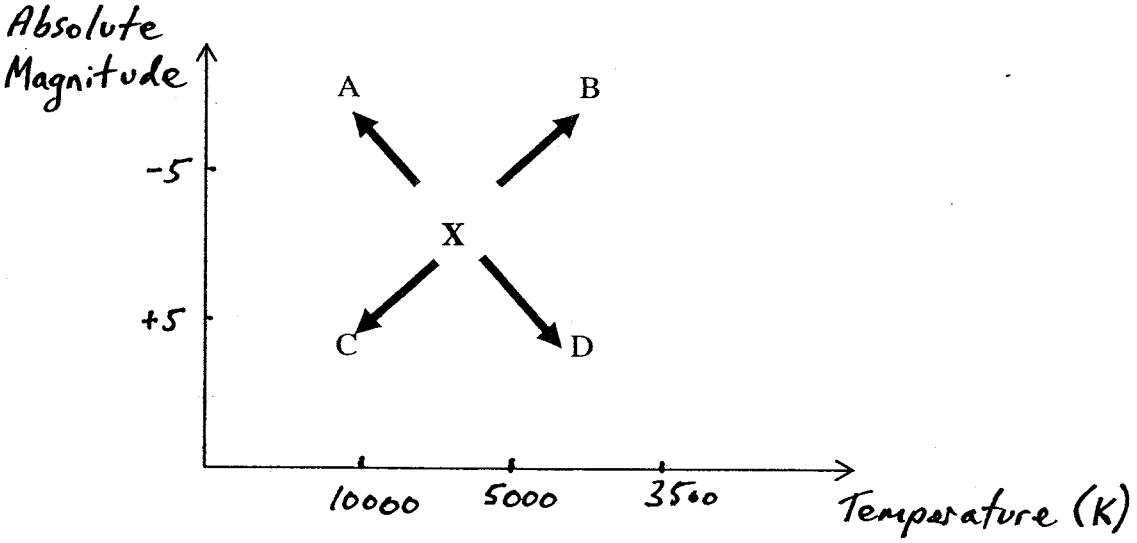
(A) the phases of the moon.

(B) shooting stars.

(C) sunrise and sunset.

(D) the observed motions of the stars and planets.

13 A star's position on a Hertzsprung-Russell diagram is shown below as "X".



During the course of the star's life, it becomes hotter and much larger. Its position on the Hertzsprung-Russell diagram will move in the direction:

(A) A

(B) B

(C) C

(D) D

14 Place these different stages in the formation of the universe into their correct order:

(i) expansion and cooling of the universe

(ii) the Big Bang

(iii) gravitational attraction between particles

(iv) transformation of radiation into matter

(v) lumpiness of the gas cloud that allowed gravitational collapse

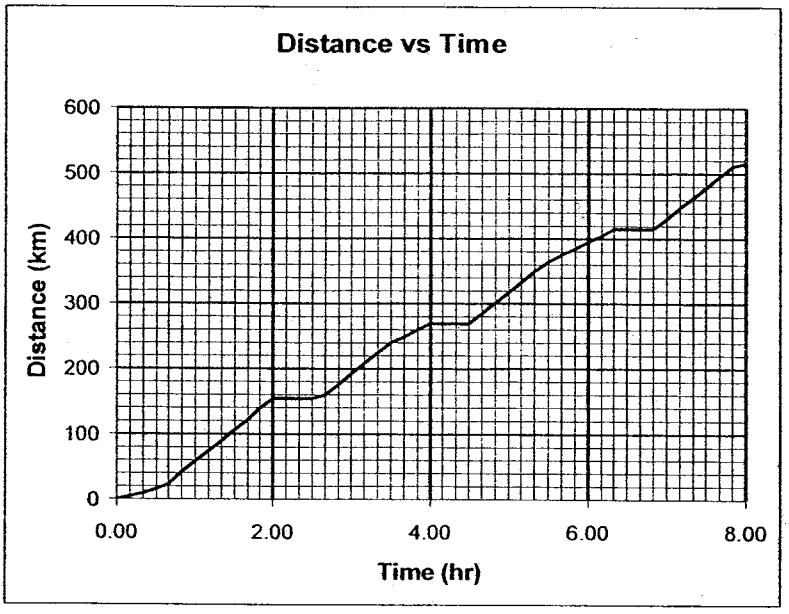
(A) (iv), (ii), (i), (v), (iv)

(B) (i), (ii), (iii), (iv), (v)

(C) (ii), (iii), (iv), (v), (i)

(D) (ii), (i), (iv), (iii), (v)

The following diagram shows a journey Winona made in a car and refers to question 15.



15. The average speed between the times of two and three hours is closest to:

A 20 kmh^{-1}
B 40 kmh^{-1}
C 60 kmh^{-1}
D 80 kmh^{-1}

Part B
55 marks

Attempt Questions 16 – 26
Allow about 90 - 95 minutes for this section

Marks

Question 16 (7 marks)

Ebony decided to perform an investigation to determine the relationship between the intensity of light and the distance from the light source. She had at her disposal access to a dark room, a candle with a box of matches, a tape measure, a data logger and a light intensity probe.

(a) Outline how Ebony could set up the experiment, gather and analyse results. **5**

(b) If Ebony determined the intensity of light to be 12 Wm^{-2} when the distance from the candle to the probe was 40 cm, determine the intensity of light at a distance of 100 cm. **2**

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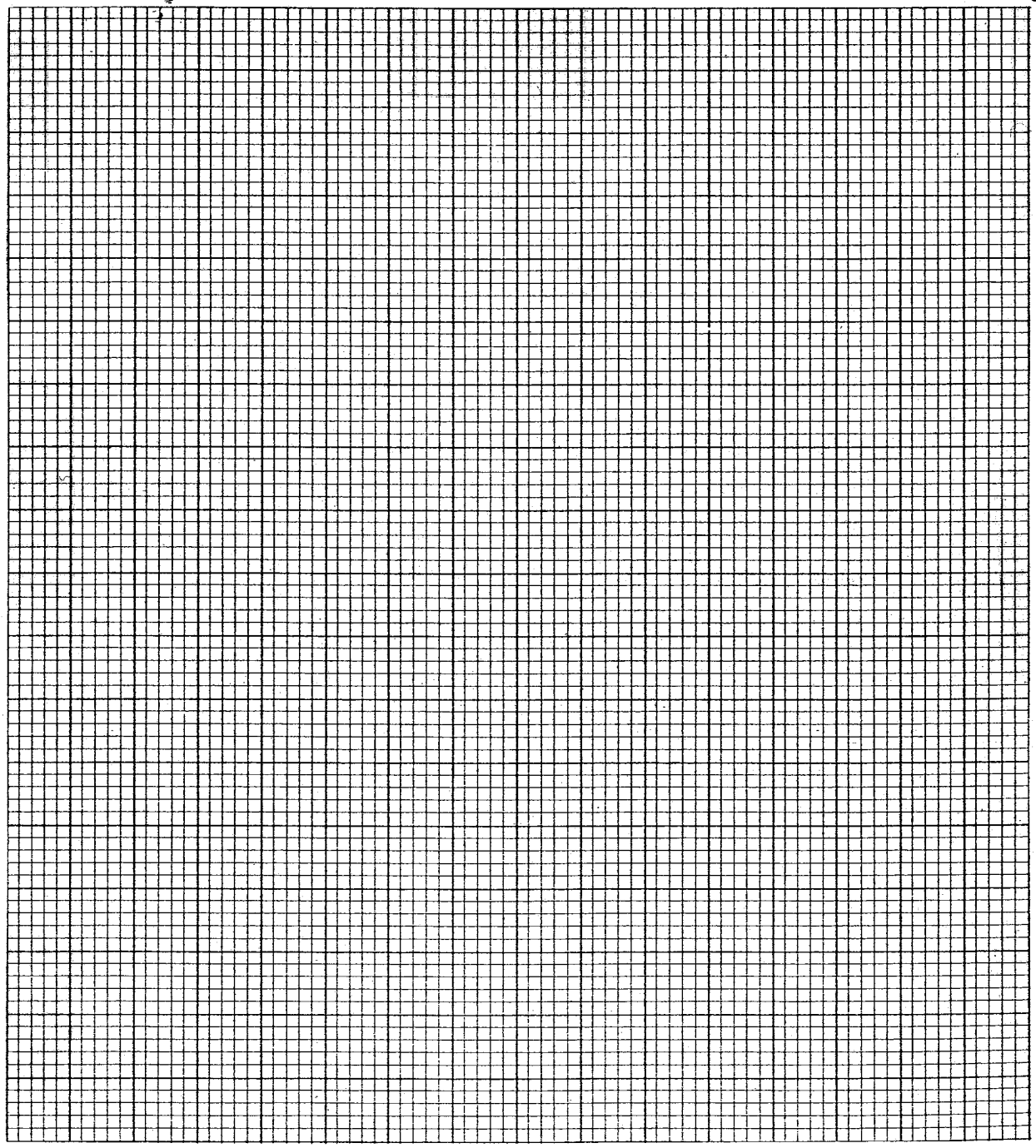
Marks

Question 17 (5 marks)

Theodore measured the angles of incidence and refraction for a beam of light entering a glass prism. He obtained the results below.

angle of incidence (degrees)	angle of refraction (degrees)
20	11
30	17
40	22
50	27
60	31

(a) Construct a **suitable** graph that displays a **linear** relationship between the two variables. **3**

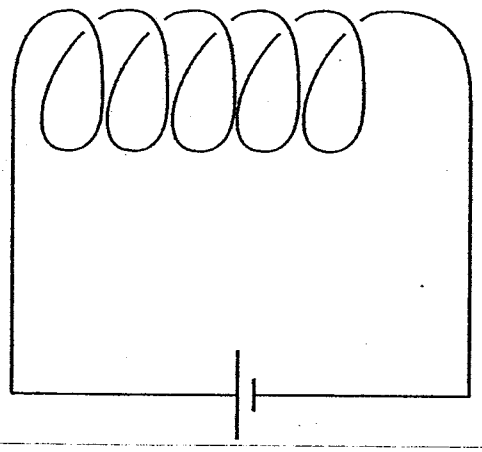


Marks

(b) Determine the speed of light in the prism. **2**

Question 18 (2 marks)

Below is a diagram of a solenoid. Draw in the magnetic field lines. **2**



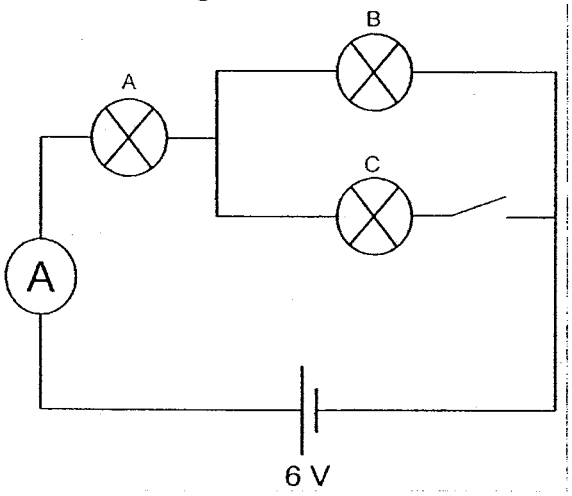
Question 19 (2 marks)

Fire Officers have discovered that some people replace the fuse in some older household circuits with a nail. Explain why this practice is NOT a good idea. **2**

Marks

Question 20 (6 marks)

Sinead set up the following circuit. All light bulbs in the circuit have a resistance of 2 Ω.



(a) Explain why the ammeter is placed in series in the circuit. **1**

(b) Show calculations to justify which will be the brightest bulb before and after the switch is closed. **5**

Marks

Question 21 (6 marks)

Two ice skaters are skating towards each other. One is travelling south at a speed of 7.2 ms^{-1} and has a mass of 80 kg. The other is travelling north at a speed of 3.2 ms^{-1} and has a mass of 54 kg. They collide and are entangled together such that they move off as one.

3

(a) Calculate the speed and direction of the ice skaters after their collision.

(b) Determine the total kinetic energy of the ice skaters before the collision. **1**

(c) If we were to calculate the total kinetic energy of the ice skaters after the collision, we would find that it was less than the total kinetic energy of the ice skaters before collision. Account for this loss of kinetic energy. **2**

Marks

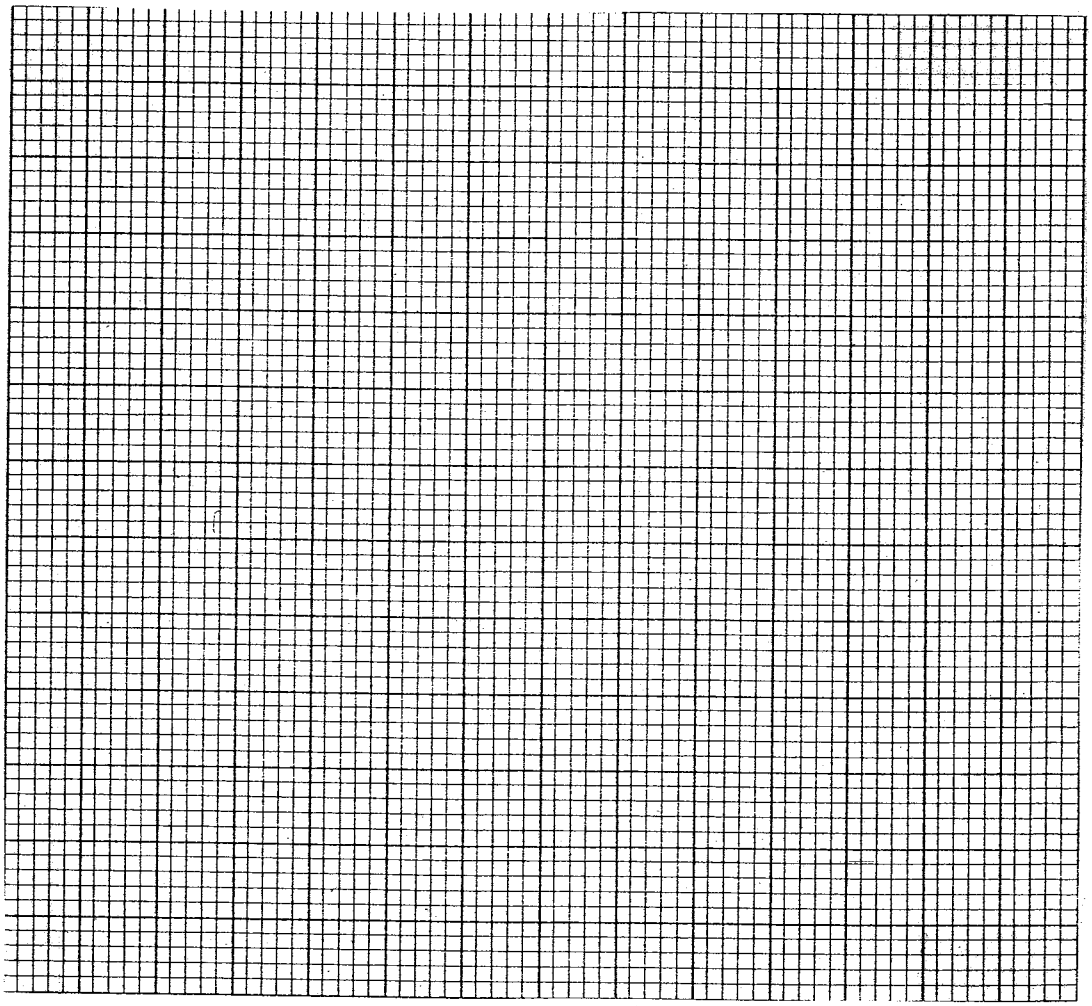
Question 22 (5 marks)

While conducting a first-hand investigation into the effect of varying the force applied to a trolley on its acceleration, the following results were obtained.

Force (N)	0.50	1.0	2.0	2.5	3.0
acceleration (ms^{-2})	0.25	0.47	1.04	1.28	1.49

The same mass was used throughout the experiment.

(a) On the grid provided plot a graph of force (on vertical axis) versus acceleration (on horizontal axis) for the results of the experiment. **3**



Marks

Question 22 (continued)

b. From your graph or otherwise, calculate the mass that was being used throughout the experiment. Show all your working. 2

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Question 23 (6 marks)

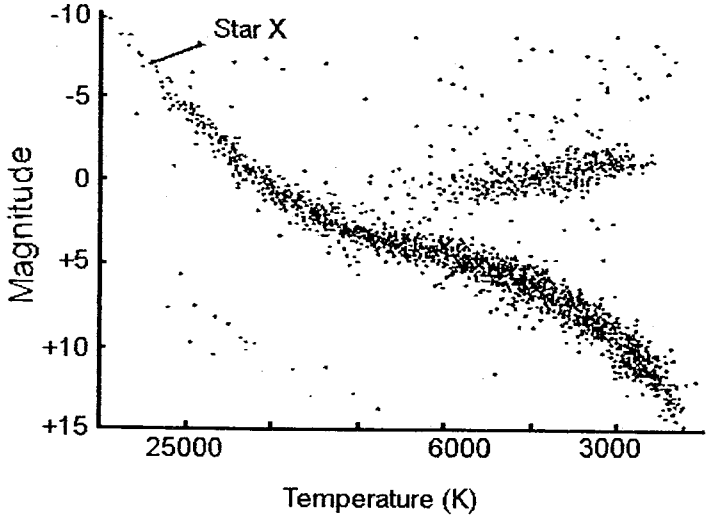
Throughout history there have been many different models developed in an attempt to explain the nature of the universe.

(a) Assess ONE of the models of the universe from the time of Aristotle to the time of Newton, clearly identifying any limitations placed on the development of the model by the technology available at the time. 3

(b) Outline the discovery of the expansion of the universe by Edwin Hubble and identify the Russian Physicist who predicted this expansion. 3

Question 24 (7 marks) **Marks**

The following diagram shows a star (Star X) on the Hertzsprung-Russell diagram.



(a) Using the diagram, identify the stellar group Star X is in. 1

(b) On the HR Diagram above clearly indicate the positions of Red Giant and White Dwarf Stars. 2

(c) Use the information below to identify the Spectral Class and colour of Star X.

Spectral Class	Colour	Temperature
O	Blue-violet	25000-50000
B	Blue-white	10000-25000
A	White	7500-10000
F	Yellow-white	6000-7500
G	Yellow	5000-6000
K	Orange	3500-5000
M	Red-orange	2500-3500

Spectral Class: _____ 1

Colour: _____ 1

(d) Identify the type of nuclear reaction occurring in the core of Star X and the fuel being used for this reaction.

Type of reaction: _____ 1

Fuel for reaction: _____ 1

Marks

Question 25 (5 marks)

A period of intense sunspot activity has significant implications for us on the Earth.

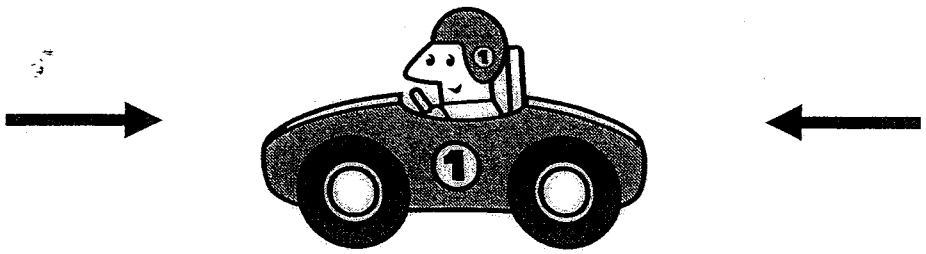
(a) Outline the effects on the Earth of a period of intense sunspot activity. **2**

(b) Account for these effects, referring in your answer to the nature of sunspots and their effect on the solar wind. **3**

Marks

Question 26 (4 marks)

A car with mass 750kg is travelling along a straight road at $10.0ms^{-1}$. The engine of the car exerts a forward force on the car of 850N. At the same time, the friction forces on the car are measured as being 700N.



700 N **850N**

a. Calculate the acceleration of the car. **2**

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b. How fast will the car be moving after 8.0s? Assume all the forces on the car remain constant. **2**

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