



**PHYSICS**

**Standard Level**

Friday 14 May 1999 (afternoon)

Paper 1

45 minutes

This examination paper consists of 30 questions.  
Each question offers 4 suggested answers.  
The maximum mark for this paper is 30.

**INSTRUCTIONS TO CANDIDATES**

Do **NOT** open this examination paper until instructed to do so.

Answer **ALL** questions.

For each question, choose the answer you consider to be the best and indicate your choice on the answer sheet provided.

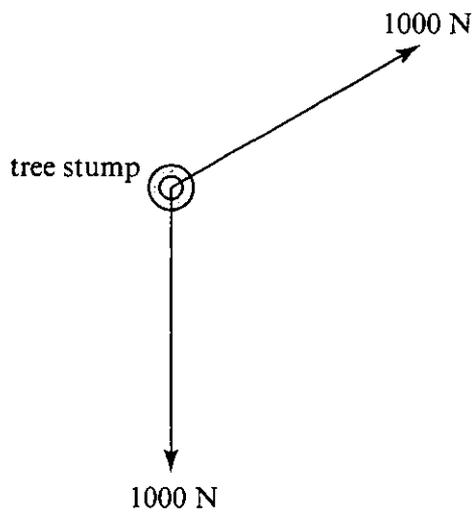
Calculators are **NOT** permitted for this examination paper.

**EXAMINATION MATERIALS**

Required:  
Optically Mark Read (OMR) answer sheet  
Physics SL Data Booklet

Allowed:  
A simple translating dictionary for candidates not working in their own language

1. Which one of the following is a fundamental unit in the International System of units, (S.I.)?
  - A. newton
  - B. ampere
  - C. joule
  - D. pascal
  
2. To pull a tree stump out of the ground, two tractors pull on ropes as shown in the diagram below. The view is from the top.



Which of the following is the best estimate for the magnitude of the **resultant** of these two forces?

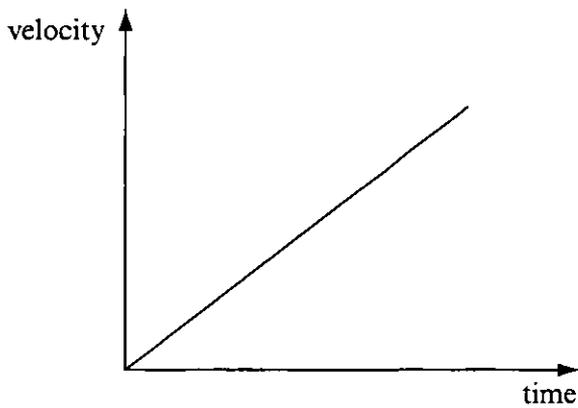
- A. 0 N
- B. 1000 N
- C. 1500 N
- D. 2000 N

3. An object, initially at rest, is subjected to a constant resultant force. Readings are taken of its velocity  $v$  at different distances  $s$  from its starting position.

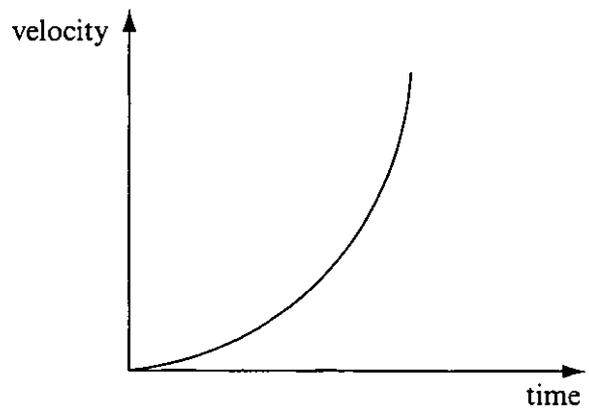
Which one of the following graphs should be plotted to yield a straight-line graph?

- A.  $s$  versus  $v$
- B.  $s$  versus  $v^2$
- C.  $s^2$  versus  $v$
- D.  $s^2$  versus  $v^2$

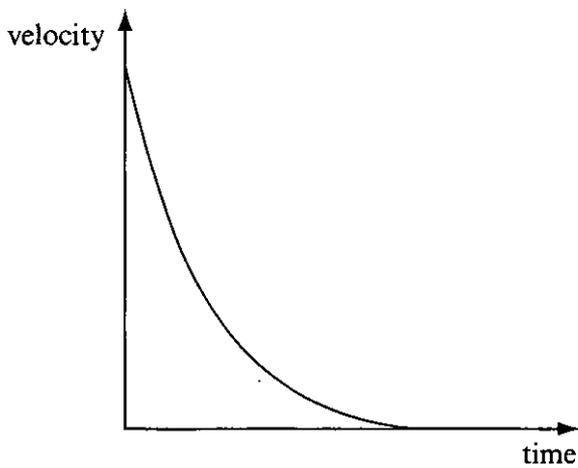
4. Which one of the following graphs best represents the velocity-time graph of an object subjected to a constant resultant force?



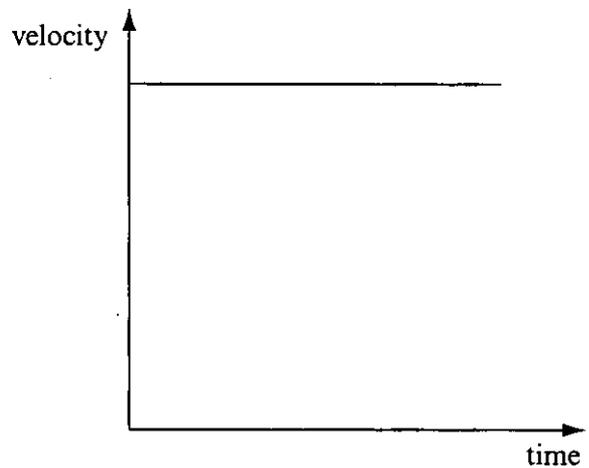
A.



B.



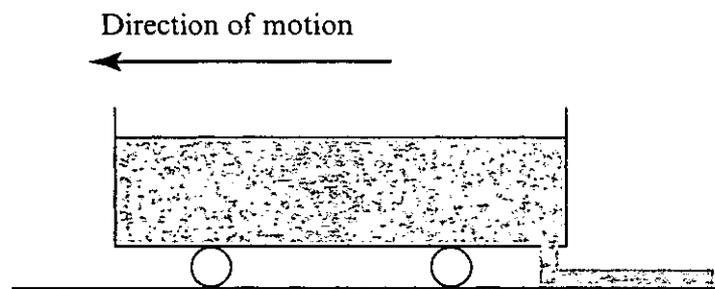
C.



D.

5. A car is travelling forward at constant velocity. The total weight of the car and passengers is 1000 N. The **resultant** force on the car must be
- A. greater than 1000 N.
  - B. 1000 N.
  - C. between 1000 N and zero.
  - D. zero.

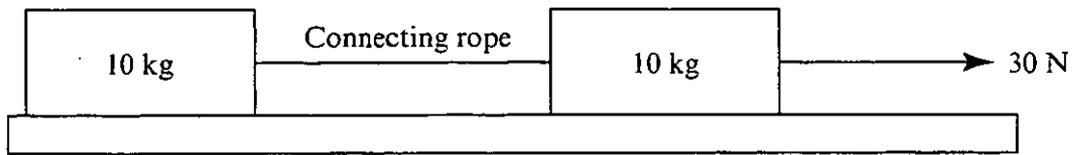
6. The diagram shows a train car that is loaded with fine sand.



It is coasting at a constant speed along a long horizontal rail where frictional effects are negligible. A hole develops in the bottom of the car and sand starts spilling out onto the ground below at a constant rate. While the sand is spilling out the speed of the train car will

- A. increase uniformly.
- B. decrease uniformly.
- C. increase non-uniformly.
- D. remain constant.

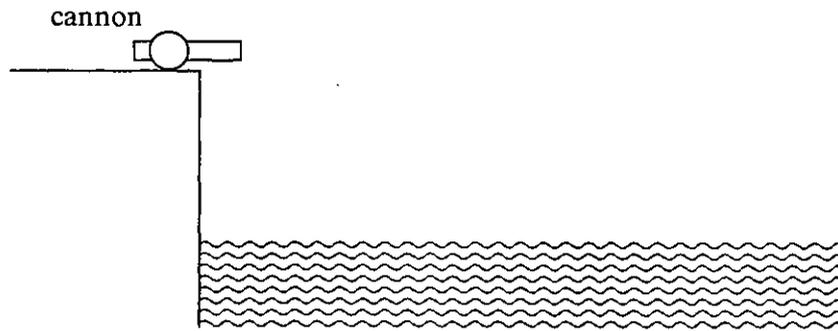
7. Two 10 kg blocks on a smooth horizontal surface are tied together. They are accelerated by a horizontal force of 30 N which acts as shown below:



If frictional effects are negligible, what is the tension in the connecting rope?

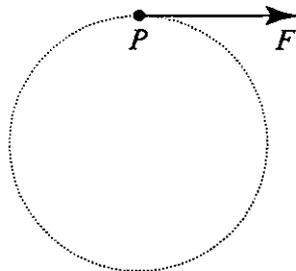
- A. 30 N
  - B. 15 N
  - C. 10 N
  - D. 0 N
8. A woman is standing on a flat section of ground. Her weight is 500 N. Newton's third law states that there must be an equal and opposite force to her weight, which is
- A. the Earth exerting an upward force of 500 N on the woman.
  - B. the woman exerting an upward force of 500 N on the Earth.
  - C. the woman exerting a downward force of 500 N on the Earth.
  - D. the Earth exerting a downward force of 500 N on the woman.

9. A cannonball is fired horizontally from a cannon at the edge of a cliff that overlooks the sea, as shown in the diagram below. At the same instant an identical cannonball is dropped vertically from the cliff edge.

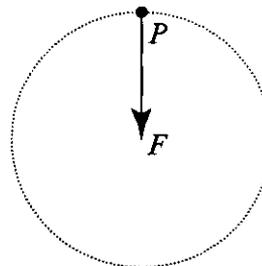


Assuming that air resistance is negligible and the cannonballs start from the same height, which statement is correct?

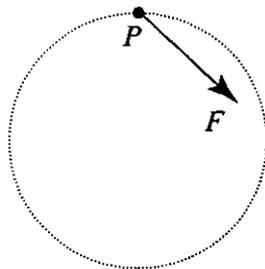
- A. The cannonball that was fired horizontally hits the sea first.
  - B. The cannonball which dropped vertically hits the sea first.
  - C. Both cannonballs would hit the sea at the same time.
  - D. It is impossible to say which cannonball hits the sea first without knowing the speed with which the cannonball was fired and the height of the cliff.
10. A particle is moving clockwise around a horizontal circle at constant speed. Which one of the following diagrams correctly shows the force  $F$  acting on the particle when it is at point  $P$ ?



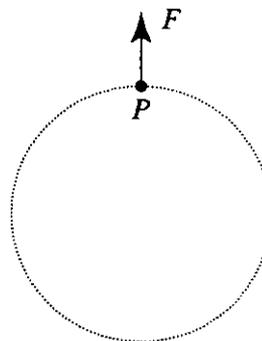
A.



B.



C.



D.

11. Two freely moving objects collide and stick together. If they are still moving after the collision, which one of the following is correct?

	<b>Total Kinetic Energy</b>	<b>Total Momentum</b>
A.	Remains unchanged	Remains unchanged
B.	Remains unchanged	decreases
C.	decreases	decreases
D.	decreases	Remains unchanged

12. A small block of metal is taken out of boiling water, where it had come to equilibrium at 100°C, and placed into a calorimeter containing water at 0°C. The mass of the block is equal to the mass of cold water. The specific heat capacity of the metal is less than that of the water. Ignoring any transfer of thermal energy to the container, the equilibrium temperature of the block plus water will be

- A. less than 50°C.
- B. 50°C.
- C. more than 50°C.
- D. 100°C.

13. Why do metallic objects generally feel cooler to the touch than wooden objects when both are at a temperature of 20°C?

- A. Wood has a higher specific heat capacity than metal.
- B. Wood has a lower specific heat capacity than metal.
- C. Thermal energy tends to flow from metal to wood.
- D. Metal conducts thermal energy better than wood.

14. Three products are being considered as possible thermal insulators. The thicknesses and conductivities of the three products are as follows:

	Conductivity /arbitrary units	Thickness /arbitrary units
Product I	12	4
Product II	6	6
Product III	4	2

For a given cross-sectional area, which product would make the best thermal insulator?

- A. Product I
  - B. Product II
  - C. Product III
  - D. They would all give the same insulation.
15. In order to double the average speed of the molecules in a given sample of gas, the absolute temperature of the gas must
- A. halve.
  - B. increase by a factor of  $\sqrt{2}$ .
  - C. double.
  - D. quadruple.
16. A transverse wave is travelling from left to right as shown below.



Given only the above information, one can deduce that the direction of the oscillations **must** be

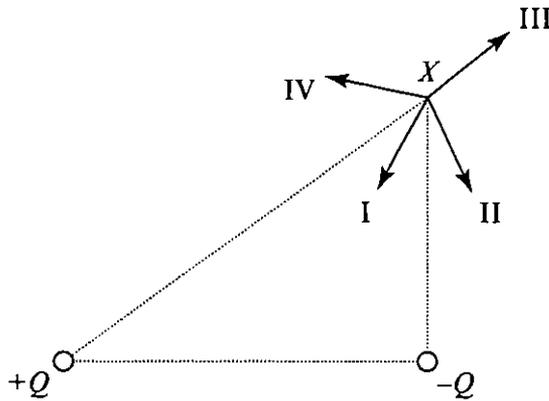
- A. up and down the paper.
- B. left and right on the paper.
- C. in and out of the paper.
- D. at right angles to the direction of wave travel.

17. Sound travels faster in water than in air. If sound waves are generated under water, a small fraction can travel into air above the water. Which one of the following combinations is true for the sound waves as they move from water into air?

Frequency	Wavelength
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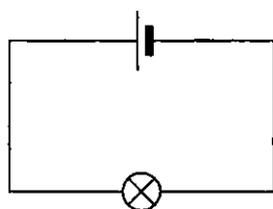
- |              |           |
|--------------|-----------|
| A. decreases | unchanged |
| B. decreases | decreases |
| C. unchanged | decreases |
| D. unchanged | unchanged |
18. A 1 m long organ pipe is open at one end and closed at the other. Ignoring end effects, the wavelength of its fundamental note is
- A. 0.25 m.
  - B. 0.5 m.
  - C. 2 m.
  - D. 4 m.
19. If the oscillations of the electric field in a beam of light are all along one direction, the light is said to be
- A. resonant.
  - B. polarised.
  - C. coherent.
  - D. refracted.

20. The diagram shows two charges of magnitude  $+Q$  and  $-Q$ . Which of the labelled arrows best shows the direction of the electric field at the point  $X$ ?

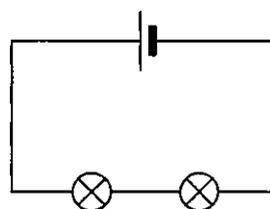


- A. I  
B. II  
C. III  
D. IV
21. Two small electrically charged objects attract each other with a force  $F$ . The charges on these objects are doubled **and** the separation is doubled. The attractive force is now
- A.  $4F$ .  
B.  $16F$ .  
C.  $F$ .  
D.  $\frac{F}{4}$ .

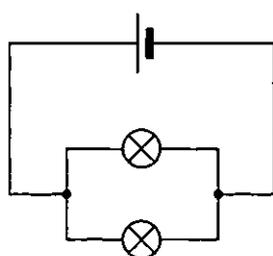
22. In an experiment, identical new batteries were connected to each of the following combinations of identical bulbs. In which situation would the battery lose all its stored energy in the **shortest** amount of time?



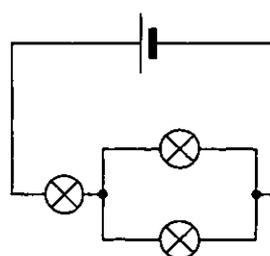
A.



B.

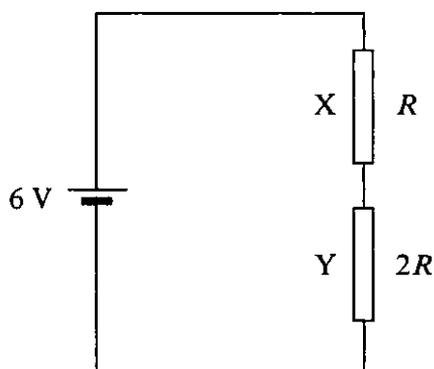


C.



D.

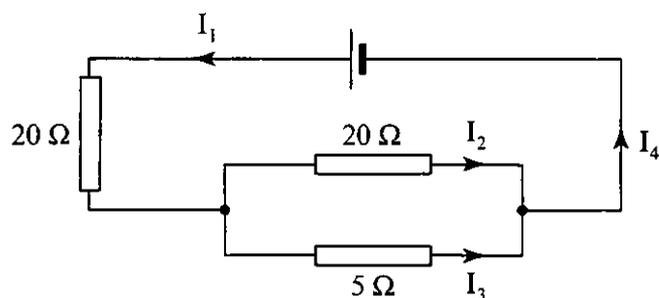
23. Two resistors, X and Y, of values  $R$  and  $2R$  respectively, are connected in series to a 6 V battery of negligible internal resistance as shown below.



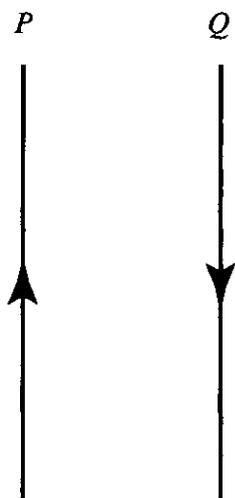
The potential difference across resistor Y will be

- A. 2 V.
- B. 3 V.
- C. 4 V.
- D. 6 V.

24. A circuit consists of a battery and three resistors as shown below. The currents at different parts of the circuit are labelled. Which of the following gives a correct relationship between currents?



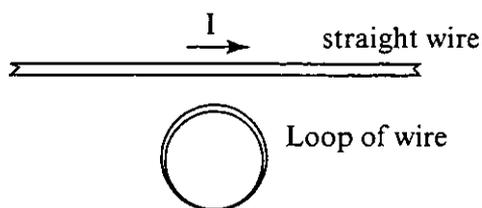
- A.  $I_2 = I_3$   
 B.  $I_1 = I_2$   
 C.  $4I_3 = I_2$   
 D.  $4I_2 = I_3$
25. Currents flow in two wires  $P$  and  $Q$  as shown in the diagram.



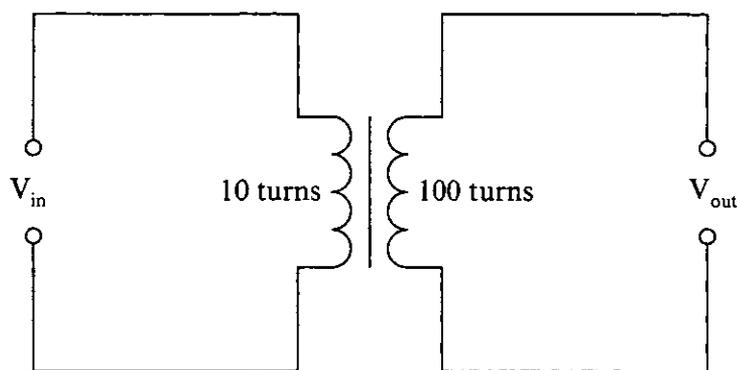
Which combination gives the correct field direction at  $Q$  and the force on  $Q$ , due to the current in  $P$ ?

- | Direction of field at $Q$<br>due to current in $P$ | Direction of force on $Q$<br>due to current in $P$ |
|--|--|
| A. into plane of paper                             | towards $P$  |
| B. out of plane of paper                           | towards $P$  |
| C. into plane of paper                             | away from $P$                                      |
| D. out of plane of paper                           | away from $P$                                      |

26. In the arrangement shown below, if the current in the straight wire is **increasing** with time, the current induced in the loop will be



- A. zero.
  - B. clockwise.
  - C. anticlockwise.
  - D. alternating.
27. The diagram below represents a transformer with input and output terminals



If a 20 V **battery** is connected to the input terminals then at steady state the voltage output would be

- A. zero.
- B. 2 V.
- C. 20 V.
- D. 200 V.

28. A charged oil drop of mass  $m$  carries a charge  $q$  and is between two parallel, horizontal plates a distance  $d$  apart. If the charge is stationary between the plates then the potential difference between the plates must be equal to:

- A.  $mgd/q$
- B.  $q/mgd$
- C.  $mgq/d$
- D.  $d/mgq$

29. Oxygen-15 decays to nitrogen-15 with a half-life of approximately 2 minutes. A pure sample of oxygen-15, with a mass of 100 g, is placed in an airtight container. After 4 minutes, the masses of oxygen and nitrogen in the container will be

	Mass of oxygen	Mass of nitrogen
A.	0 g	100 g
B.	25 g	25 g
C.	50 g	50 g
D.	25 g	75 g

30. A radioactive nuclide  ${}_zX$  undergoes a sequence of radioactive decays to form a new nuclide  ${}_{z+2}Y$ . The sequence of emitted radiations could be

- A.  $\beta, \beta$ .
- B.  $\alpha, \beta, \beta$ .
- C.  $\alpha, \alpha$ .
- D.  $\alpha, \beta, \gamma$ .