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**PHYSICS  
STANDARD LEVEL  
PAPER 1**

Thursday 10 May 2012 (afternoon)

45 minutes

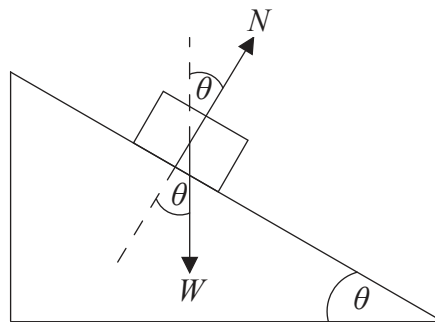
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**INSTRUCTIONS TO CANDIDATES**

- Do not open this examination paper until instructed to do so.
- Answer all the questions.
- For each question, choose the answer you consider to be the best and indicate your choice on the answer sheet provided.
- A clean copy of the **Physics Data Booklet** is required for this paper.
- The maximum mark for this examination paper is [30 marks].

1. What is the order of magnitude of the mass, in kg, of an apple?
- A.  $10^{-3}$
  - B.  $10^{-1}$
  - C.  $10^{+1}$
  - D.  $10^{+3}$

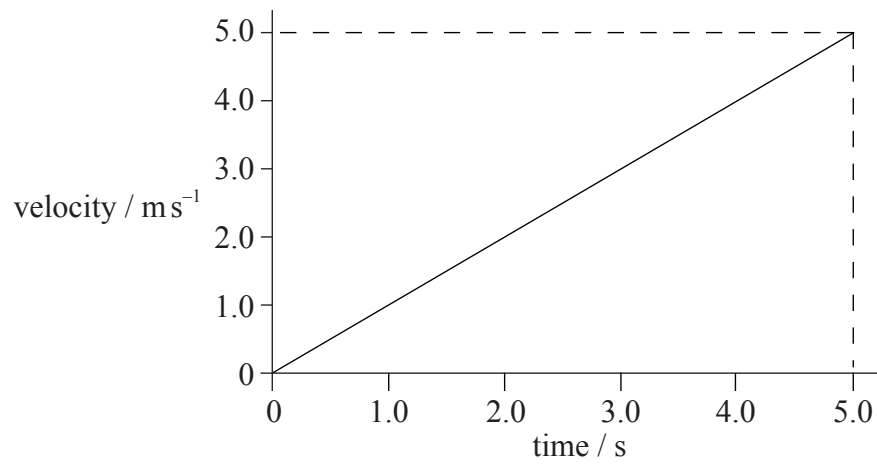
2. The diagram below shows the forces acting on a block of weight  $W$  as it slides down a slope. The angle between the slope and the horizontal is  $\theta$ , the normal reaction force on the block from the slope is  $N$  and friction is negligible.



Which of the following gives the resultant force on the block?

- A.  $W \sin \theta$
- B.  $W \cos \theta$
- C.  $N \sin \theta$
- D.  $N \cos \theta$

3. The velocity–time graph for an accelerating object that is travelling in a straight line is shown below.

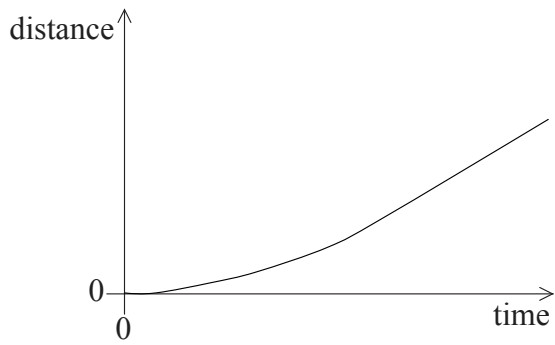


Which of the following is the change in displacement of the object in the first 5.0 seconds?

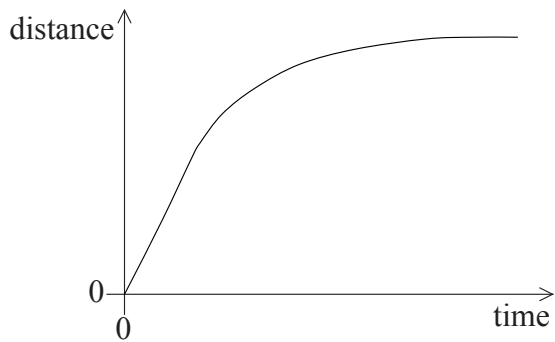
- A. 25.0 m
- B. 12.5 m
- C. 5.0 m
- D. 1.0 m

4. An object falls vertically from rest. Air resistance acts on the object and it reaches a terminal speed. Which of the following is the distance–time graph for its motion?

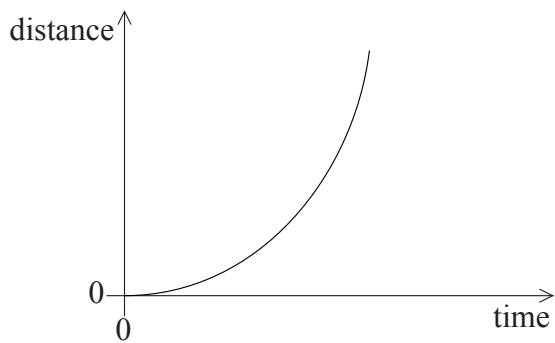
A.



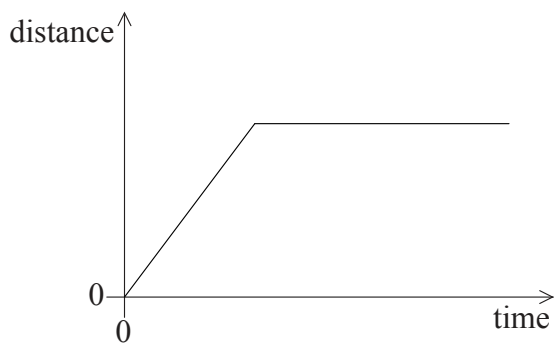
B.



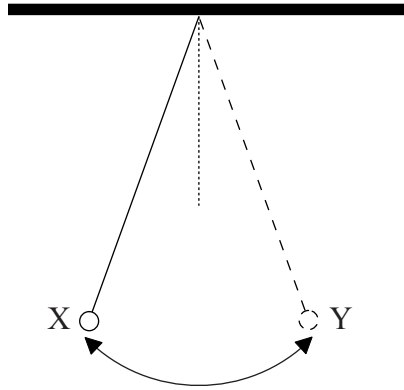
C.



D.



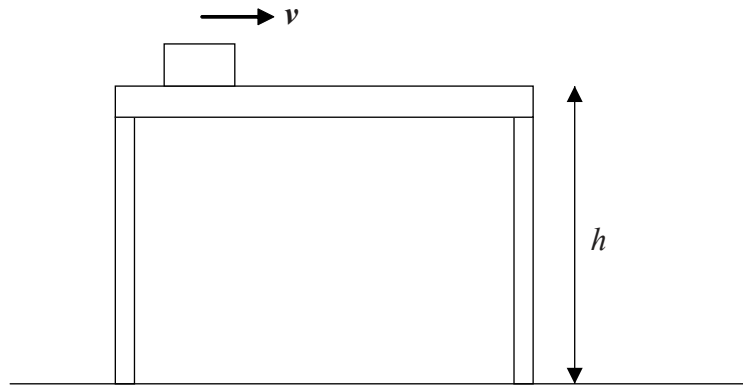
5. A pendulum swings back and forth in a circular arc between X and Y.



The pendulum bob is

- A. always in equilibrium.
- B. only in equilibrium at X and Y.
- C. in equilibrium as it passes through the central position.
- D. never in equilibrium.

6. A block of mass  $m$  is moving at constant velocity  $v$  along a frictionless surface that is height  $h$  above the ground.



Which expression gives the work necessary to maintain the constant velocity?

- A.  $mgh$
- B.  $\frac{1}{2}mv^2$
- C.  $mgh + \frac{1}{2}mv^2$
- D. zero
7. Which of the following is an elastic collision?
- A. Two railway trucks collide and they link together.
- B. Two railway trucks collide and they do not link together.
- C. Two gas molecules collide and each changes direction.
- D. Two gas molecules collide and a bond is formed between them.
8. A car moves at constant speed around a horizontal circular track. The resultant force on the car is always equal to
- A. the forward force from the engine.
- B. the sideways friction between the tyres and the track.
- C. the weight of the car.
- D. zero.

9. The total potential energy and random kinetic energy of the molecules of an object is equal to the
- A. heat energy in the object.
  - B. internal energy of the object.
  - C. thermal energy in the object.
  - D. work stored in the object.

10. Which of the following correctly distinguishes between the evaporation and the boiling of a liquid under atmospheric pressure?

	<b>Evaporation</b>	<b>Boiling</b>
A.	takes place at one fixed temperature	occurs at the surface of the liquid
B.	takes place at all temperatures	occurs at the surface of the liquid
C.	takes place at one fixed temperature	occurs throughout the body of the liquid
D.	takes place at all temperatures	occurs throughout the body of the liquid

11. An ideal gas has an absolute temperature  $T$ . The average random kinetic energy of the molecules of the gas is
- A. independent of  $T$ .
  - B. equal to  $T$ .
  - C. proportional to  $T$ .
  - D. inversely proportional to  $T$ .

12. An object is undergoing simple harmonic motion (SHM) about a fixed point P. The magnitude of its displacement from P is  $x$ . Which of the following is correct?

	<b>Magnitude of resultant force</b>	<b>Direction of resultant force</b>
A.	proportional to $x$	towards P
B.	inversely proportional to $x$	towards P
C.	proportional to $x$	away from P
D.	inversely proportional to $x$	away from P

13. An object undergoes simple harmonic motion (SHM). The total energy of the object is proportional to

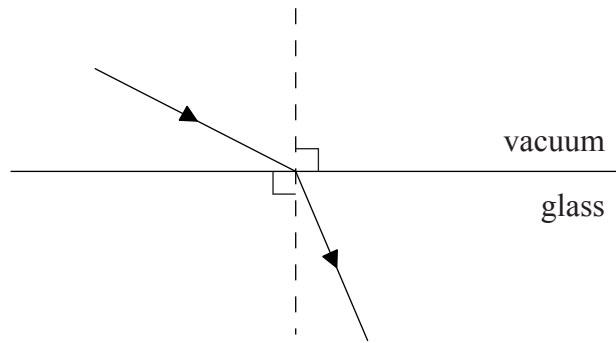
- A. the amplitude of the oscillations.
- B. the time period of the oscillations.
- C. the frequency of the oscillations.
- D. the mass of the object.

14. What region of the electromagnetic spectrum includes waves of wavelength  $5 \times 10^{-8}$  m?

- A. X-ray
- B. Ultraviolet
- C. Infrared
- D. Microwave



15. A ray of light travels from a vacuum into glass as shown below.



In glass, light has speed  $v$ . In a vacuum, light has speed  $c$ . Which of the following gives the refractive index of glass?

- A.  $\frac{c}{v}$
- B.  $\frac{v}{c}$
- C.  $\frac{\sin c}{\sin v}$
- D.  $\frac{\sin v}{\sin c}$
16. The ampere is defined in terms of
- A. power dissipated in a wire of known length, cross-sectional area and resistivity.
- B. potential difference across a resistance of known value.
- C. number of electrons flowing past a point in a circuit in a given time.
- D. force per unit length between parallel current-carrying conductors.
17. A battery of emf  $6.0\text{ V}$  is connected to a  $2.0\ \Omega$  resistor. The current in the circuit is  $2.0\text{ A}$ . The internal resistance of the battery is
- A. zero.
- B.  $1.0\ \Omega$ .
- C.  $3.0\ \Omega$ .
- D.  $4.0\ \Omega$ .

18. Which of the following gives the resistances of an ideal ammeter and an ideal voltmeter?

	Resistance of ideal ammeter	Resistance of ideal voltmeter
A.	infinite	infinite
B.	zero	infinite
C.	infinite	zero
D.	zero	zero

19. A mass at point  $X$  gives rise to a gravitational field strength  $g$  at point  $P$  as shown below.



An identical mass is placed at point  $Y$  as shown below.



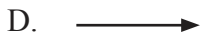
The resultant gravitational field strength at  $P$  is now

- A. greater than  $2g$ .
  - B. between  $2g$  and  $g$ .
  - C. between  $g$  and zero.
  - D. zero.
20. The electric field strength between two oppositely charged parallel plates
- A. has the same value everywhere between the two plates.
  - B. decreases from the positive plate to the negative plate.
  - C. is larger at the edges than in the centre.
  - D. is smaller at the edges than in the centre.

21. Three parallel wires, X, Y and Z, carry equal currents into the page.



Which arrow represents the direction of the magnetic force on wire Z?



22. When compared with beta particles and gamma-ray photons, alpha particles have the greatest

- A. mass.
- B. penetrating power.
- C. range in air.
- D. speed.

23. Which statement correctly describes the process of nuclear fusion?

- A. The joining together of two small atoms to create a larger atom.
- B. The splitting up of a large atom to create two smaller atoms.
- C. The joining together of two small nuclei to create a larger nucleus.
- D. The splitting up of a large nucleus to create two smaller nuclei.

24. The fraction of the world's energy consumption provided by nuclear energy is
- A. less than 0.2%.
  - B. between 0.2% and 2%.
  - C. between 2% and 20%.
  - D. greater than 20%.
25. The burning of fossil fuels in power stations produces greenhouse gases. Another potential environmental problem is that
- A. the emissions can destroy the ozone layer.
  - B. the emissions can cause acid rain.
  - C. the maximum efficiency is very low.
  - D. the energy density of the fuels is low compared to renewable resources.
26. In a nuclear power station, in order to increase the chances of a chain reaction
- A. kinetic energy is removed from the neutrons.
  - B. kinetic energy is given to the neutrons.
  - C. some neutrons are absorbed.
  - D. extra neutrons are added.
27. The original source of the electrical power produced by a wind generator is
- A. the Sun's radiated energy.
  - B. the gravitational energy of the Sun and the Moon.
  - C. nuclear energy stored within atoms in the Earth's atmosphere.
  - D. the Earth's internal energy.

28. Increasing the temperature of a black-body will have the following effect on its emission spectrum.

	<b>Total power radiated</b>	<b>Peak wavelength of radiation</b>
A.	increases	decreases
B.	stays the same	decreases
C.	increases	stays the same
D.	stays the same	stays the same

29. A natural process that could cause an increase in global warming is

- A. an increase in the radius of the Earth’s orbit around the Sun.
- B. an increase in the absorption of carbon dioxide by sea water.
- C. a drop in mean sea-level.
- D. deforestation as a result of natural ecosystem changes.

30. What is the unit for the coefficient of volume expansion?

- A.  $\text{m}^3 \text{K}^{-1}$
- B.  $\text{m}^3$
- C. K
- D.  $\text{K}^{-1}$