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**PHYSICS**  
**STANDARD LEVEL**  
**PAPER 1**

Thursday 10 May 2012 (afternoon)

45 minutes

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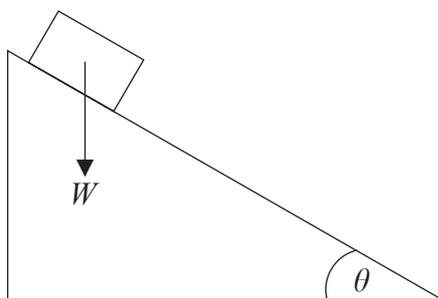
INSTRUCTIONS TO CANDIDATES

- 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. Which of the following is a fundamental SI unit?

- A. Ampere
- B. Joule
- C. Newton
- D. Volt

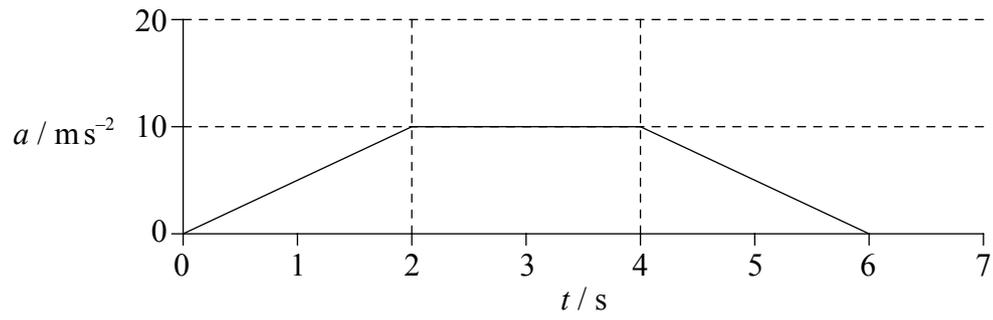
2. An object slides down an inclined plane that makes an angle  $\theta$  with the horizontal. The weight of the object is  $W$ .



Which of the following is the magnitude of the component of the weight parallel to the plane?

- A.  $W \sin \theta$
- B.  $\frac{W}{\sin \theta}$
- C.  $W \cos \theta$
- D.  $\frac{W}{\cos \theta}$

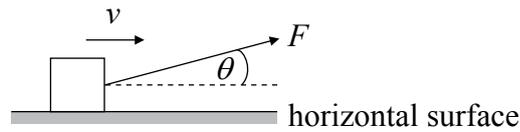
3. The graph shows the acceleration  $a$  of an object as time  $t$  varies.



What is the magnitude of the change in the velocity of the object between 0 and 3 seconds?

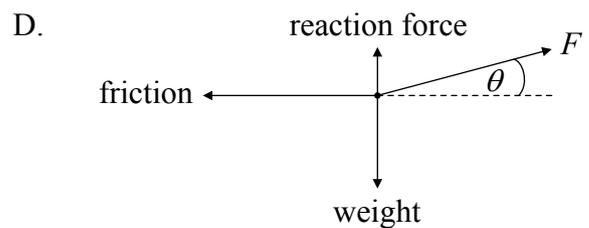
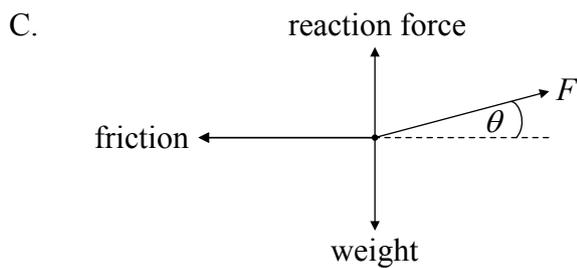
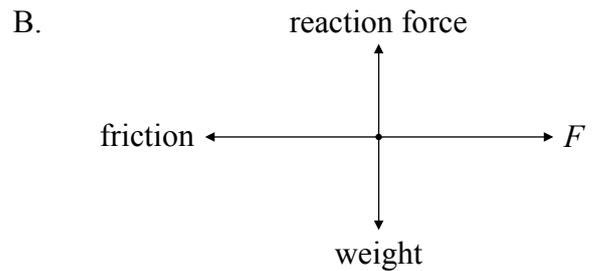
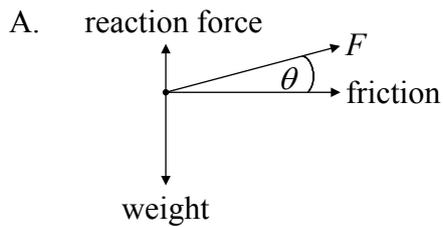
- A.  $5 \text{ m s}^{-1}$
- B.  $10 \text{ m s}^{-1}$
- C.  $20 \text{ m s}^{-1}$
- D.  $30 \text{ m s}^{-1}$

4. A force  $F$  acts on a block at an angle  $\theta$  with respect to a horizontal surface.



The block is moving with a constant velocity  $v$  along the surface. A resistive force acts on the block.

Which of the following correctly represents the forces acting on the block?



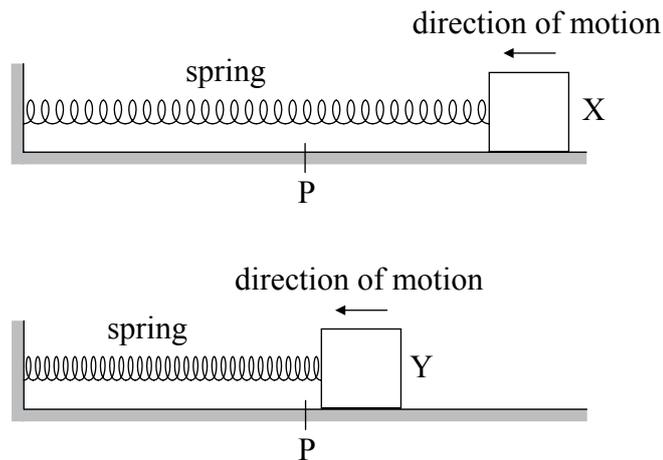
5. The momentum of a particle stays constant provided that

- A. it moves in a circle with constant speed.
- B. its acceleration is uniform.
- C. the net internal force acting on it is zero.
- D. the net external force acting on it is zero.

6. A student makes three statements about situations in which no work is done on an object.
- I. The object is moving with uniform circular motion.
  - II. A force is applied to the object in the direction of its velocity.
  - III. A force is applied to the object in a direction opposite to its motion.

Which of the above statements is/are correct?

- A. I only
  - B. I and II only
  - C. I and III only
  - D. III only
7. A block is attached to a stretched spring and then released. It moves from X to Y along a horizontal frictionless surface in the direction shown. The mass of the spring is negligible.

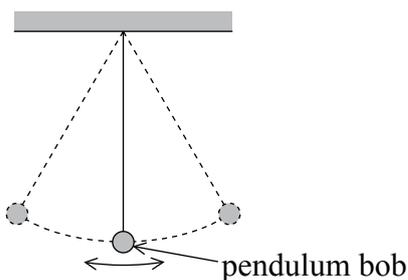


The equilibrium position of the system is P.

Which of the following is correct with respect to the changes in kinetic energy and potential energy of the block and of the spring as the block moves from X to Y?

	<b>Block</b>	<b>Spring</b>
A.	kinetic energy decreases	potential energy increases
B.	kinetic energy increases	potential energy decreases
C.	potential energy decreases	kinetic energy increases
D.	potential energy increases	kinetic energy decreases

8. A pendulum bob is attached to a light string and is swinging in a vertical plane.



At the lowest point of the motion, the magnitude of the tension in the string is

- A. less than the weight of the mass of the pendulum bob.
  - B. zero.
  - C. greater than the weight of the mass of the pendulum bob.
  - D. equal to the weight of the mass of the pendulum bob.
9. Thermal energy is transferred to a solid. Three properties of the solid are
- I. volume
  - II. mass
  - III. specific heat capacity.

Which of the above properties determine the rise in temperature of the solid?

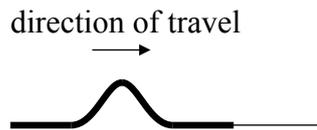
- A. I and III only
- B. II and III only
- C. II only
- D. III only

10. Which of the following changes on its own will increase the rate of evaporation of a liquid at constant temperature?
- A. An increase in the surface area of the liquid
  - B. An increase in the total pressure acting on the liquid
  - C. A decrease in the surface area of the liquid
  - D. A decrease in the volume of the liquid
11. The specific latent heat of a substance is defined as the energy required at constant temperature to
- A. change the phase.
  - B. change the phase of 1 kg.
  - C. change the phase of 1 m<sup>3</sup>.
  - D. change the phase of 1 kg every second.
12. A particle undergoing simple harmonic motion (SHM) oscillates with time period  $T$  and angular frequency  $\omega$ . The time period of the SHM changes to  $2T$ . Which of the following gives the new value of  $\omega$ ?
- A.  $\frac{\omega}{4}$
  - B.  $\frac{\omega}{2}$
  - C.  $2\omega$
  - D.  $4\omega$

13. A particle is undergoing simple harmonic motion (SHM) in a horizontal plane. The total mechanical energy of the system is  $E$ . Which of the following correctly gives the kinetic energy of the particle at the positions of maximum displacement and equilibrium?

	Maximum displacement	Equilibrium
A.	$\frac{1}{2}E$	$\frac{1}{2}E$
B.	0	$E$
C.	$\frac{1}{2}E$	0
D.	$E$	0

14. A wave pulse is travelling along a dense thick rope which is connected to a less dense thin rope.



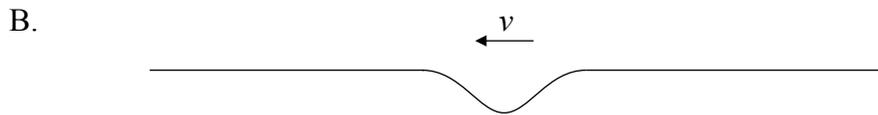
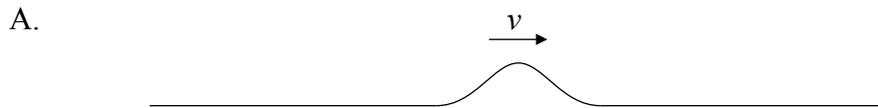
Which of the following is correct regarding the reflected and transmitted wave pulses after the wave pulse reaches the connection of the two ropes?

	Reflected pulse	Transmitted pulse
A.	inverted	inverted
B.	not inverted	inverted
C.	inverted	not inverted
D.	not inverted	not inverted

15. Two wave pulses travel along a string towards each other. The diagram shows their positions at a moment in time.



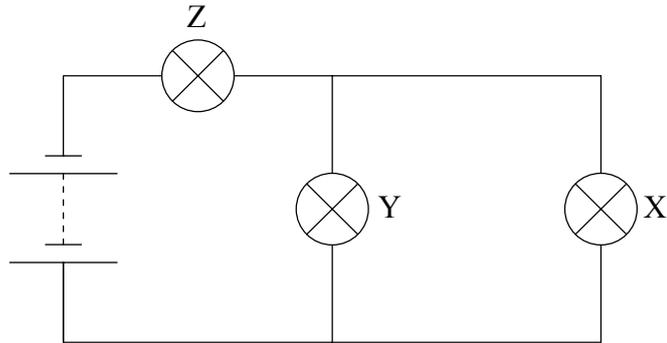
Which of the following shows a possible configuration of the pulses at a later time?



16. A metal wire X with length  $L$  and radius  $r$  has a resistance  $R$ . A wire Y of length  $4L$  made from the same material as X has the same resistance  $R$ . What is the radius of Y?

- A.  $2r$
- B.  $4r$
- C.  $\frac{r}{2}$
- D.  $\frac{r}{4}$

17. Three identical filament lamps, X, Y and Z, are connected as shown to a battery of negligible internal resistance.



The filament of lamp X breaks. Which of the following correctly describes the change in brightness of lamp Y and of lamp Z?

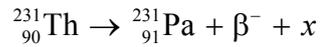
	<b>Lamp Y</b>	<b>Lamp Z</b>
A.	increase	increase
B.	decrease	increase
C.	increase	decrease
D.	decrease	decrease

18. Which of the following is the correct way of connecting an ammeter and of connecting a voltmeter in a circuit designed to measure the characteristics of a thermistor?

	<b>Ammeter</b>	<b>Voltmeter</b>
A.	in series with thermistor	in series with thermistor
B.	in parallel with thermistor	in series with thermistor
C.	in series with thermistor	in parallel with thermistor
D.	in parallel with thermistor	in parallel with thermistor

19. A particle of mass  $m$  is a distance  $R$  from the surface of Earth of mass  $M$ . The force acting on the particle is  $F$ . Which of the following is the gravitational field strength at  $R$ ?
- A.  $\frac{Gm}{R^2}$
- B.  $\frac{GmM}{R^2}$
- C.  $\frac{F}{m}$
- D.  $\frac{F}{M}$
20. Coulomb's law refers to electric charges that are
- A. on any charged objects.
- B. charged hollow spheres.
- C. charged solid spheres.
- D. point charges.
21. Which of the following will **not** give rise to a magnetic field?
- A. A moving electron
- B. A moving neutron
- C. A proton and electron moving away from each other
- D. A proton and electron moving towards each other

22. The nuclear reaction equation for the decay of a nucleus of thorium-231 (Th-231) to a nucleus of protactinium-231 (Pa-231) is shown below.



The particle  $x$  is a

- A. proton.
  - B. antineutrino.
  - C. neutron.
  - D. electron.
23. Which of the following is correct for nuclear fuel in respect of both its energy density and its long-term sustainability?

	<b>Energy density</b>	<b>Sustainability</b>
A.	high	renewable
B.	low	renewable
C.	high	non-renewable
D.	low	non-renewable

24. Which of the following is the primary function of the moderator in a nuclear power station?
- A. To control the rate of fission reactions
  - B. To absorb neutrons
  - C. To prevent the power station from becoming unsafe
  - D. To slow down neutrons

25. The half-life of a particular radioactive isotope is 8 days. The initial activity of a pure sample of the isotope is  $A$ .

Which of the following is the time taken for the activity of the isotope to change by  $\frac{7}{8}A$ ?

- A. 7 days
- B. 24 days
- C. 32 days
- D. 56 days
26. The blades of a certain wind turbine X have radius  $r$ . The maximum theoretical available wind power for a given wind speed is  $P$ . Another similar turbine Y has blades of radius  $2r$ . What is the best estimate for the maximum theoretical available wind power from turbine Y?
- A.  $8P$
- B.  $4P$
- C.  $\frac{P}{4}$
- D.  $\frac{P}{8}$
27. Attempts to produce a sustained, controlled and viable nuclear fusion reaction have failed because of the difficulty of maintaining
- A. high plasma temperatures.
- B. high plasma pressure.
- C. the fuel supply injection into the plasma.
- D. strong magnetic fields.

28. The property of the molecules of greenhouse gases which leads to their ability to absorb infrared radiation is their
- A. resonant frequency.
  - B. speed of rotation.
  - C. total electric charge.
  - D. diameter.
29. Gases in the Earth's atmosphere believed to be responsible for the greenhouse effect include
- A. sulfur dioxide, nitrous oxide, water.
  - B. methane, carbon monoxide, ozone.
  - C. carbon dioxide, sulfur trioxide, carbon monoxide.
  - D. water, methane, nitrous oxide.
30. Which of the following is the most likely cause of the enhanced greenhouse effect?
- A. Increased volcanic activity
  - B. Deforestation
  - C. Burning of fossil fuels
  - D. Solar flare activity
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