



88136504



PHYSICS
STANDARD LEVEL
PAPER 1

Wednesday 6 November 2013 (morning)

45 minutes

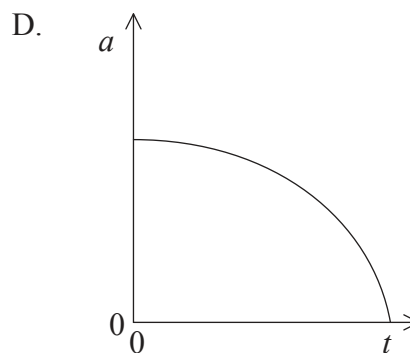
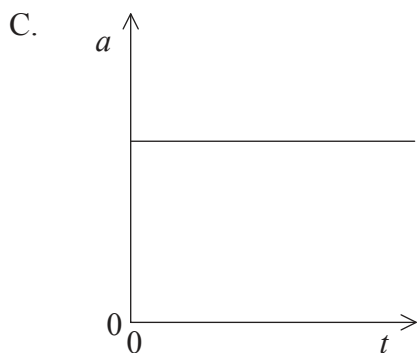
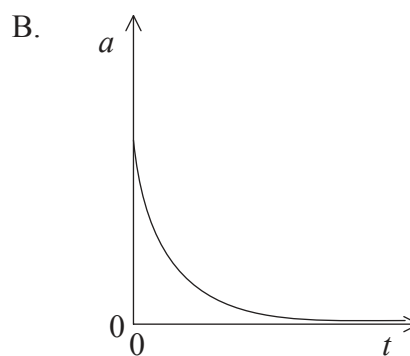
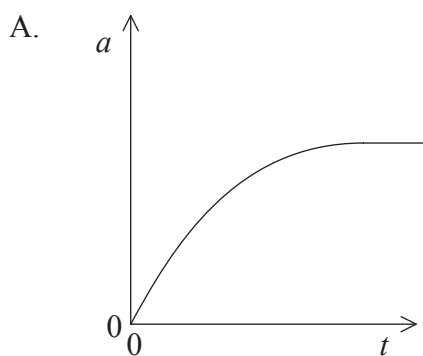
INSTRUCTIONS TO CANDIDATES

- 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. The sides of a square are measured to be 5.0 ± 0.2 cm. Which of the following gives the area of the square and its uncertainty?
 - A. 25.0 ± 0.2 cm²
 - B. 25.0 ± 0.4 cm²
 - C. 25 ± 2 cm²
 - D. 25 ± 4 cm²

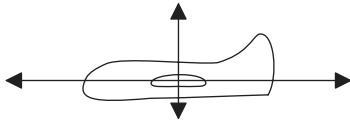
2. Which of the following lists two vector quantities and one scalar quantity?
 - A. force, mass, time
 - B. acceleration, energy, momentum
 - C. distance, impulse, power
 - D. density, pressure, temperature

3. A tennis ball is dropped from the top of a high building. Air resistance **cannot** be neglected. Which graph represents the variation with time t of the magnitude of the acceleration a of the ball before it hits the ground?

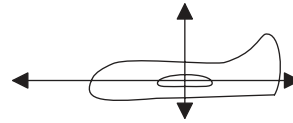


4. A model plane flies with constant velocity at constant height. Which diagram represents the forces acting on the plane?

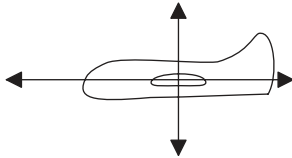
A.



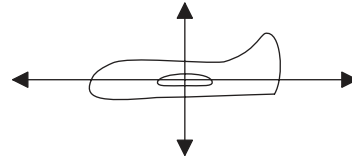
B.



C.



D.



5. The net force on a body is F . The impulse of F is equal to the

- A. change in momentum of the body.
- B. rate of change of momentum of the body.
- C. change of kinetic energy of the body.
- D. change of total energy of the body.

6. In an inelastic collision

- A. momentum and kinetic energy are both conserved.
- B. momentum is conserved but kinetic energy is not.
- C. kinetic energy is conserved but momentum is not.
- D. neither momentum nor kinetic energy are conserved.

7. A force which increases uniformly from 0 to a maximum value of F is applied to an object. The object does not move until the force exceeds $0.5F$. As the force increases from $0.5F$ to F the object moves a distance x in the direction of the force. What is the work done by this force?
- A. $0.25Fx$
- B. $0.5Fx$
- C. $0.75Fx$
- D. Fx
8. A body moves with uniform speed around a circle of radius r . The period of the motion is T . What is the speed of the body?
- A. $\frac{2\pi r}{T}$
- B. $\frac{2\pi T}{r}$
- C. Zero
- D. $\frac{\pi r^2}{T}$
9. Molar mass is defined as
- A. the number of particles in one mole of a substance.
- B. $\frac{1}{12}$ the mass of one atom of carbon-12.
- C. the mass of one mole of a substance.
- D. the number of particles in $\frac{1}{12}$ of a mole of carbon-12.

10. Which of the following is true about boiling and evaporation?

| | Boiling | Evaporation |
|----|--------------------------|--------------------------|
| A. | occurs throughout liquid | occurs at liquid surface |
| B. | occurs throughout liquid | occurs throughout liquid |
| C. | occurs at liquid surface | occurs at liquid surface |
| D. | occurs at liquid surface | occurs throughout liquid |

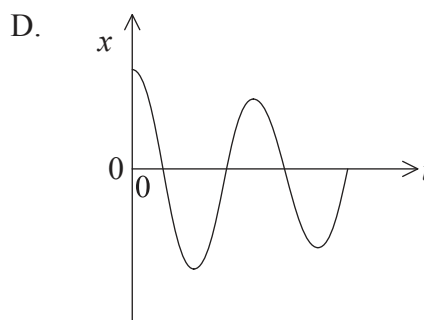
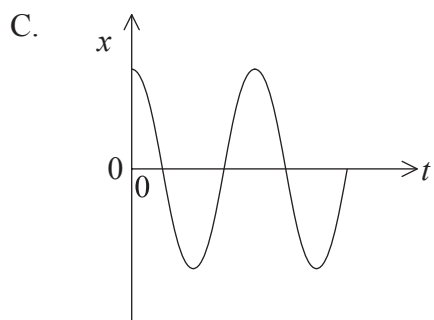
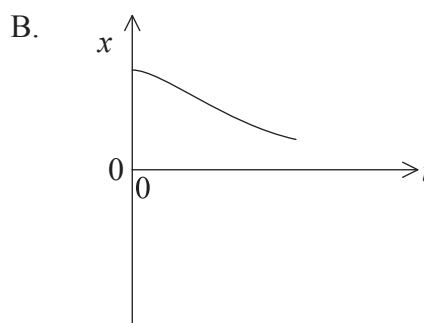
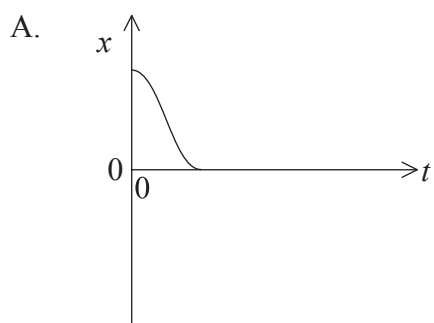
11. A solid of mass m is initially at temperature ΔT below its melting point. The solid has specific heat capacity c and specific latent heat of fusion L . How much thermal energy must be transferred to the solid in order to melt it completely?

- A. $mL+mc$
- B. $mc+mL\Delta T$
- C. $mc\Delta T+L\Delta T$
- D. $mc\Delta T+mL$

12. For a body undergoing simple harmonic motion the velocity and acceleration are

- A. always in the same direction.
- B. always in opposite directions.
- C. in the same direction for a quarter of the period.
- D. in the same direction for half the period.

13. Which graph of displacement x against time t represents the motion of a critically damped body?



14. Which of the following correctly relates the direction of oscillation of the particles in a medium to the direction of energy propagation for transverse and longitudinal waves?

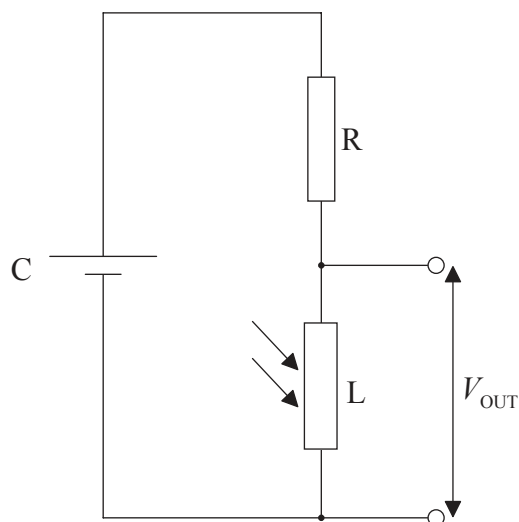
| | Transverse wave | Longitudinal wave |
|----|-----------------|-------------------|
| A. | perpendicular | perpendicular |
| B. | perpendicular | parallel |
| C. | parallel | perpendicular |
| D. | parallel | parallel |

15. Which of the following relates the amplitude A of a travelling wave to the intensity I ?

- A. $A \propto I^{-1}$
- B. $A \propto I^{-\frac{1}{2}}$
- C. $A \propto I^{\frac{1}{2}}$
- D. $A \propto I^2$

16. Two identical waves of wavelength λ leave two sources in phase. The waves meet and superpose after travelling different distances. Which path difference will result in destructive interference?
- A. $\frac{\lambda}{4}$
 - B. $\frac{\lambda}{2}$
 - C. $\frac{3\lambda}{4}$
 - D. λ
17. A resistor X of resistance R is made of wire of length L and cross-sectional area A . Resistor Y is made of the same material but has a length $4L$ and a cross-sectional area $2A$. X and Y are connected in series. What is the total resistance of the combination?
- A. $1.5R$
 - B. $2R$
 - C. $3R$
 - D. $9R$

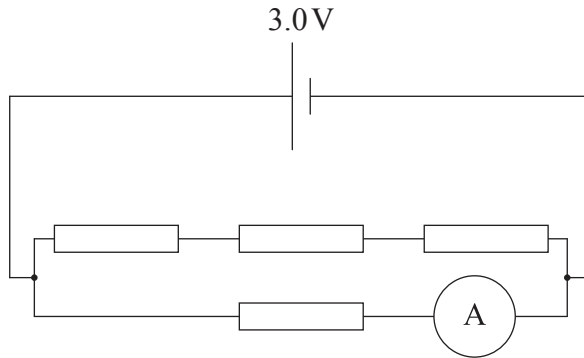
18. A light dependent resistor L is connected in series with a cell C and a fixed resistor R . The cell has a negligible internal resistance. V_{OUT} is the output voltage across L .



Which change will increase V_{OUT} ?

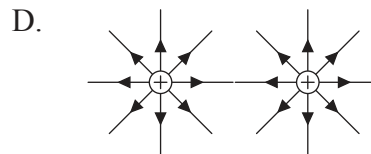
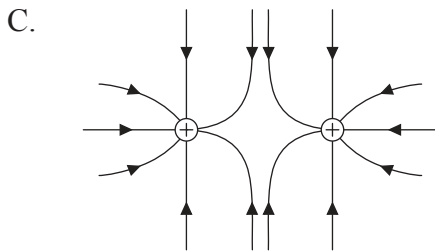
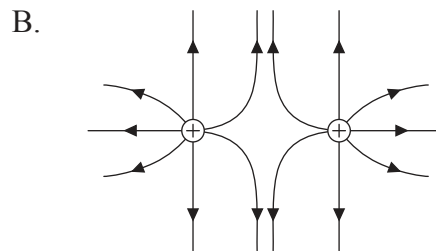
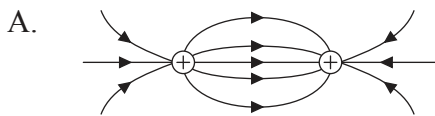
- A. Connect another resistor in parallel with L
- B. Decrease the intensity of light on L
- C. Increase the resistance of R
- D. Decrease the emf of C

19. Each of the resistors in the circuit has a resistance of 2.0Ω . The cell has an emf of 3.0V and negligible internal resistance. The ammeter has negligible resistance.



What is the ammeter reading?

- A. 0.4A
 - B. 0.5A
 - C. 1.5A
 - D. 2.0A
20. Which diagram represents the pattern of electric field lines of two small positive point charges held at the positions shown?



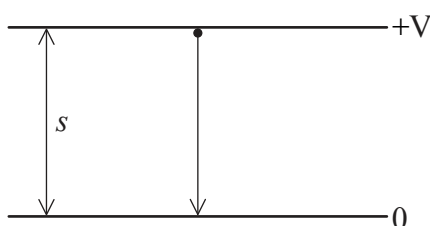
21. The force F between particles in gravitational and electric fields is related to the separation r of the particles by an equation of the form

$$F = a \frac{bc}{r^2}.$$

Which of the following identifies the units for the quantities a , b and c for a gravitational field?

| | a | b and c |
|----|-----------------------------|-------------|
| A. | Nm^2C^{-2} | C |
| B. | Nm^2C^{-2} | kg |
| C. | $\text{Nm}^2\text{kg}^{-2}$ | C |
| D. | $\text{Nm}^2\text{kg}^{-2}$ | kg |

22. An electron of mass m_e and charge e accelerates between two plates separated by a distance s in a vacuum. The potential difference between the plates is V .



What is the acceleration of the electron?

- A. $\frac{m_e eV}{s}$
- B. $\frac{m_e V}{es}$
- C. $\frac{eV}{m_e s}$
- D. $\frac{V}{m_e es}$

23. In a particular atom, the nucleon number is the total number of
- A. protons.
 - B. neutrons.
 - C. electrons.
 - D. protons and neutrons.
24. For which quantity can the unit MeV c^{-2} be used?
- A. Mass
 - B. Momentum
 - C. Kinetic energy
 - D. Binding energy
25. Uranium-238 (${}_{92}^{238}\text{U}$) forms a nucleus of plutonium-239 (${}_{94}^{239}\text{Pu}$) as a result of
- A. electron capture followed by alpha decay.
 - B. electron capture followed by beta decay.
 - C. neutron capture followed by alpha decay.
 - D. neutron capture followed by two beta decays.
26. In the production of electric power, an advantage of using photovoltaic cells rather than fossil fuels is that the photovoltaic cells
- A. can be effective in any location.
 - B. can be used continuously.
 - C. have low initial set-up costs.
 - D. are more environmentally friendly when in use.

27. What is the main role of the control rods and the main role of the moderator in a thermal fission reactor?

| | Control Rods | Moderator |
|----|------------------------|------------------------|
| A. | decrease neutron speed | decrease neutron speed |
| B. | decrease neutron speed | absorb neutrons |
| C. | absorb neutrons | decrease neutron speed |
| D. | absorb neutrons | absorb neutrons |

28. An oscillating water column (OWC) ocean-wave energy converter uses waves to alter the air pressure in a chamber. Which energy resources must have been involved for this method to generate electricity?

- I. Tides
- II. Wind
- III. Solar

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

29. The surface temperature of a black-body emitter is doubled. By what factor does the power emitted by the body increase?

- A. 32
- B. 16
- C. 4
- D. 2

30. Which option is **not** a possible solution to reduce the enhanced greenhouse effect?
- A. Decommission nuclear power plants
 - B. Replace the use of coal and oil with natural gas
 - C. Use combined heating and power systems (CHP)
 - D. Use hybrid motor vehicles
-