

Physics

Higher level · Predicted paper · November 2026

Paper 1A

1 hour 20 minutes

Instructions to candidates

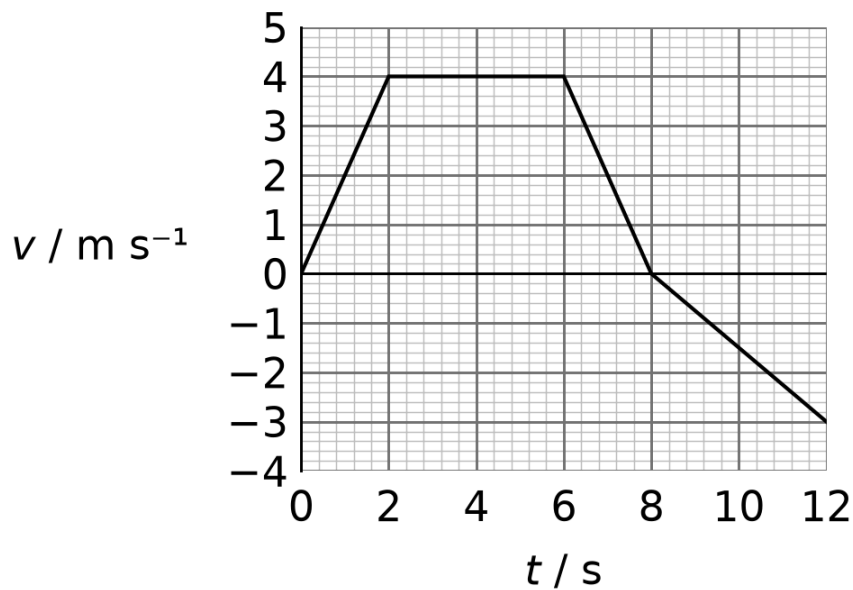
- Do not open this examination paper until instructed to do so.
- Answer all questions.
- Write your answers in the spaces provided.
- A calculator is required for this paper.
- A clean copy of the physics data booklet is required for this paper.

40 multiple-choice questions [40 marks].

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

The maximum mark for this paper is **[40 marks]**.

1. A drone moves vertically. The graph shows the variation with time t of the velocity v of the drone. Velocity is positive when the drone moves upwards.



What is the displacement of the drone from its initial position at $t = 12$ s?

- A. 12 m
B. 18 m
C. 24 m
D. 30 m
2. A ball is kicked from level ground at an angle above the horizontal. Air resistance on the ball is not negligible. The ball lands on the same level ground.

Which statement explains why the time for the ball to rise to its maximum height is less than the time for it to fall back to the ground?

- A. The ball is momentarily at rest at its maximum height and then starts to fall from rest.
B. The magnitude of the air resistance on the ball is greater during the fall than during the rise.
C. The vertical component of the air resistance acts downwards during the rise and upwards during the fall.
D. The horizontal component of the air resistance acts opposite to the horizontal velocity throughout the flight.
3. A person of mass 60 kg stands on a weighing scale on the floor of a lift. The lift is moving upwards at a speed of 3.0 m s^{-1} . The lift then decelerates uniformly and comes to rest in 1.5 s.

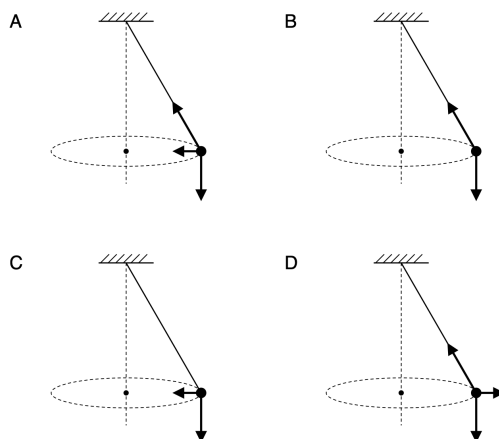
What is the reading on the scale while the lift is decelerating?

- A. 120 N
B. 470 N
C. 590 N
D. 710 N

4. A sphere of radius r is completely immersed in a liquid of density ρ . The buoyancy force on the sphere is F_1 . A sphere of radius $2r$ is completely immersed in a liquid of density $\rho/2$. The buoyancy force on this sphere is F_2 .

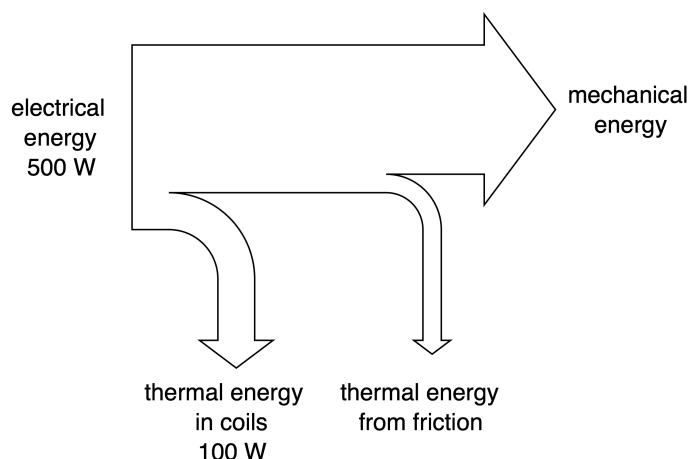
What is F_1/F_2 ?

- A. $1/8$
 B. $1/4$
 C. 1
 D. 4
5. A small ball hangs from a fixed point on a light inextensible string and moves at constant speed in a horizontal circle. Air resistance is negligible. The diagrams are side views of the ball at the instant it is at the right-hand edge of its circular path.



Which diagram shows all the forces acting on the ball?

6. The Sankey diagram, drawn to scale, shows the energy transfers in an electric motor. The friction in the motor is then reduced so that the thermal energy produced by friction each second is halved. The input power and the power dissipated in the coils are unchanged.



What is the efficiency of the motor now?

- A. 70 %
B. 75 %
C. 80 %
D. 85 %
7. An ice skater spins about a vertical axis. The frictional torque on the skater is negligible. The skater pulls both arms in towards the body. The moment of inertia of the skater about the axis decreases to one third of its initial value.

What is the ratio of the rotational kinetic energy of the skater after the arms are pulled in to the rotational kinetic energy before?

- A. $\frac{1}{3}$
B. 1
C. 3
D. 9
8. A uniform solid cylinder of mass m and radius R is fixed to a light axle of radius $R/4$ along its axis. The moment of inertia of the cylinder about this axis is $\frac{1}{2}mR^2$. The axle rolls without slipping down two parallel inclined rails, and the cylinder hangs between the rails without touching them.

What fraction of the total kinetic energy of the cylinder is rotational?

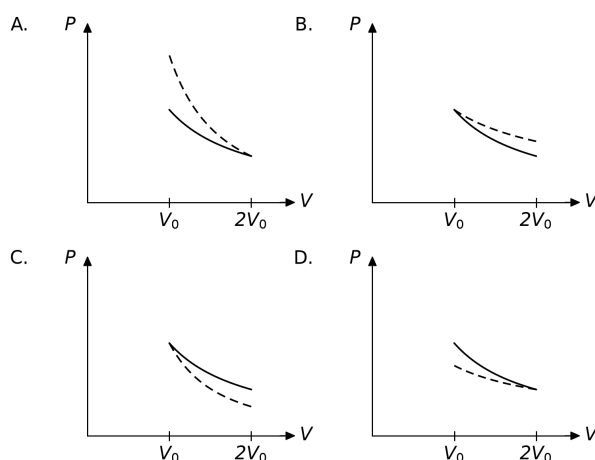
- A. $\frac{1}{9}$
B. $\frac{1}{3}$
C. $\frac{8}{9}$
D. $\frac{16}{17}$

9. Two particles, X and Y, travel towards each other along the same straight line in a particle accelerator. In the laboratory frame, each particle has a speed of $0.80c$. In this frame, the distance between X and Y decreases at a rate of $1.6c$.
What is the speed of Y in the rest frame of X?
- A. $0.80c$
 - B. $0.98c$
 - C. $1.0c$
 - D. $1.6c$
10. An ice cube of mass 0.025 kg at $0\text{ }^{\circ}\text{C}$ is placed in 0.18 kg of a drink at $28\text{ }^{\circ}\text{C}$. The drink is in a thermally insulated cup. The energy transferred to the cup is negligible. The ice melts completely.
Specific heat capacity of water and of the drink = $4.2 \times 10^3\text{ J kg}^{-1}\text{ K}^{-1}$
Specific latent heat of fusion of ice = $3.3 \times 10^5\text{ J kg}^{-1}$
What is the final temperature of the mixture?
- A. $13\text{ }^{\circ}\text{C}$
 - B. $15\text{ }^{\circ}\text{C}$
 - C. $17\text{ }^{\circ}\text{C}$
 - D. $25\text{ }^{\circ}\text{C}$
11. Two stars, X and Y, have the same radius. X and Y emit radiation as black bodies. The spectrum of X has its peak at a wavelength of 400 nm . The spectrum of Y has its peak at a wavelength of 800 nm .
What is luminosity of Y / luminosity of X?
- A. $1/16$
 - B. $1/2$
 - C. 2
 - D. 16
12. The mean cloud cover of the Earth increases. The area of the Earth covered by ice also increases. The solar constant does not change.
What are the changes in the albedo of the Earth and in the mean intensity of solar radiation absorbed by the Earth?
- A. Albedo: Increases | Absorbed intensity: Decreases
 - B. Albedo: Increases | Absorbed intensity: Increases
 - C. Albedo: Decreases | Absorbed intensity: Increases
 - D. Albedo: Decreases | Absorbed intensity: Decreases

13. A fixed mass of a real gas is in a container. The pressure of the gas is reduced. The temperature of the gas is kept constant.

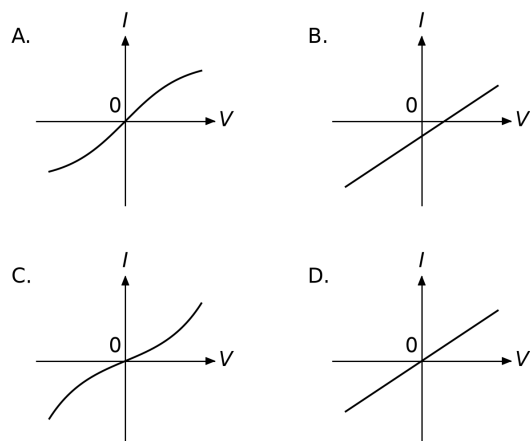
Which statement explains why the behaviour of the gas becomes closer to that of an ideal gas?

- A. Collisions between the molecules become elastic, so no kinetic energy is lost in the collisions.
 - B. The molecules are further apart, so molecular volume and intermolecular forces become negligible.
 - C. The mean speed of the molecules increases, so the effect of intermolecular forces becomes negligible.
 - D. The molecules hit each unit area of the walls less often, so the pressure of the gas decreases.
14. A fixed mass of a monatomic ideal gas expands isothermally from volume V_0 to volume $2V_0$. The gas is then returned to its initial state. It now expands slowly from V_0 to $2V_0$ in a cylinder that is thermally insulated.



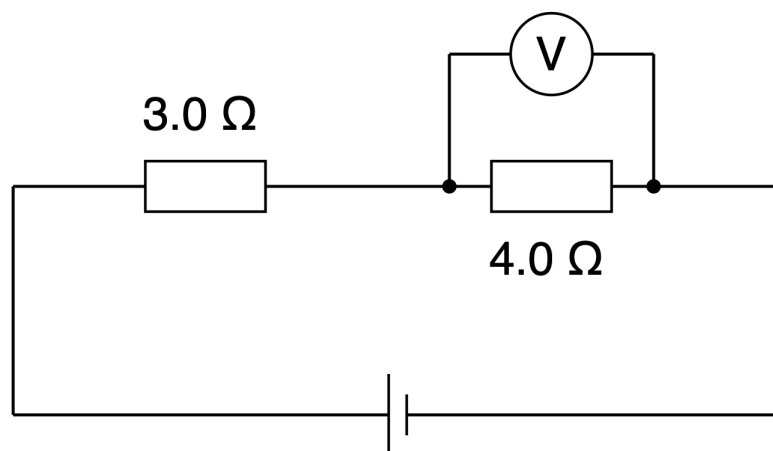
Which pressure–volume (P – V) diagram shows the isothermal expansion as a solid line and the expansion in the insulated cylinder as a dashed line?

15. Each graph shows the variation with potential difference V of the current I in a component.



Which graph is for a metal wire kept at constant temperature?

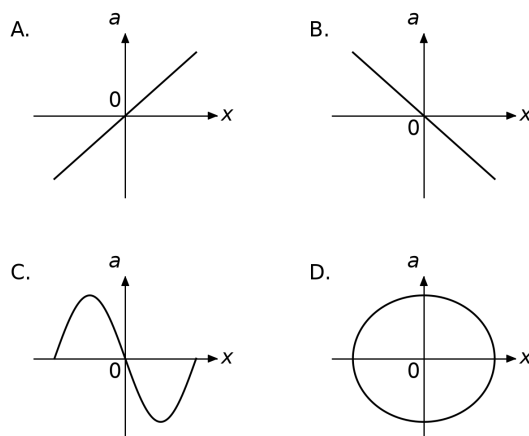
- A. Graph A
B. Graph B
C. Graph C
D. Graph D
16. A cell is connected in series with a $3.0\ \Omega$ resistor and a $4.0\ \Omega$ resistor, as shown. The cell has an internal resistance of $0.50\ \Omega$. The ideal voltmeter reads $3.2\ \text{V}$.



What is the emf of the cell?

- A. $3.4\ \text{V}$
B. $3.6\ \text{V}$
C. $5.6\ \text{V}$
D. $6.0\ \text{V}$

17. An object attached to a horizontal spring oscillates with simple harmonic motion on a frictionless surface. The displacement x of the object is measured from its equilibrium position.



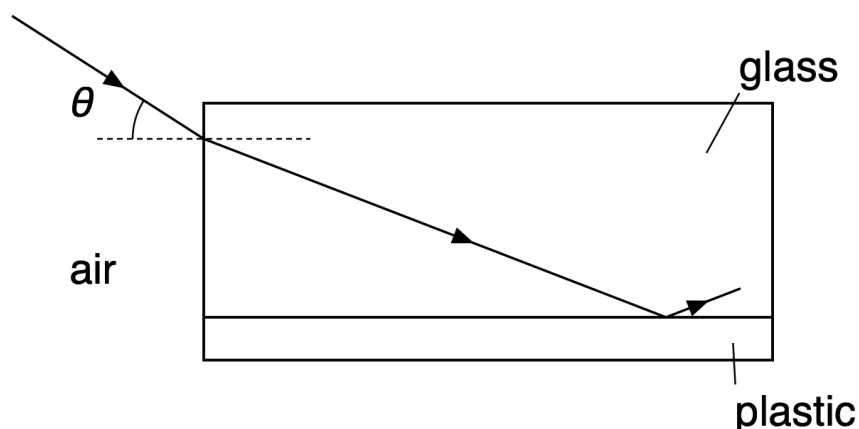
Which graph shows how the acceleration a of the object varies with x ?

18. The bob of a simple pendulum oscillates with simple harmonic motion. The period of the oscillation is 2.0 s and the amplitude is 0.10 m.

What is the speed of the bob when its displacement from the equilibrium position is 0.050 m?

- A. 0.16 m s^{-1}
 - B. 0.22 m s^{-1}
 - C. 0.27 m s^{-1}
 - D. 0.31 m s^{-1}
19. A loudspeaker emits a note into the air. The frequency of the note is then increased. The temperature of the air does not change.
- Which statement about the sound in the air is correct after the change?
- A. The wavelength of the sound stays the same.
 - B. The speed of the sound increases.
 - C. The period of the sound increases.
 - D. The speed of the sound stays the same.

20. The diagram shows a rectangular glass block resting on a sheet of transparent plastic. A ray of light in air is incident on a vertical face of the block at an angle θ to the normal. The refractive index of the glass is 1.50 and the refractive index of the plastic is 1.40.



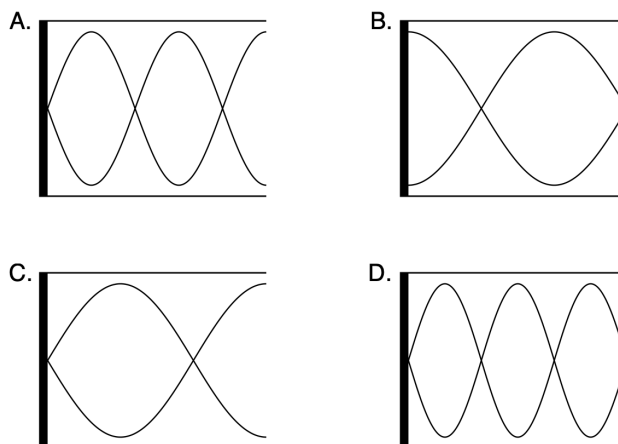
What is the value of θ for which the angle of incidence at the glass–plastic boundary is equal to the critical angle?

- A. 14°
 - B. 21°
 - C. 33°
 - D. 69°
21. Monochromatic light is incident normally on a diffraction grating. The first-order maximum is observed at an angle of 12° to the normal. The wavelength of the light is then doubled and the grating spacing is halved.

What is the new angle between the first-order maximum and the normal?

- A. 12°
- B. 25°
- C. 48°
- D. 56°

22. A pipe of length 0.85 m is closed at one end and open at the other end. A standing sound wave of frequency 300 Hz is formed in the air in the pipe. The speed of sound in the air is 340 m s^{-1} .



Which diagram shows the displacement pattern of the standing wave?

23. A siren emits sound of frequency f in still air. In situation 1, the siren moves at speed u towards a stationary cyclist. In situation 2, the siren is stationary and the cyclist moves towards it at the same speed u . The speed u is less than the speed of sound.

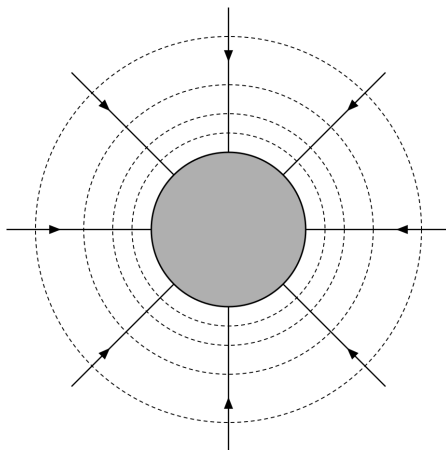
Which row compares the frequency of the sound heard by the cyclist and the wavelength of the sound in the air between the siren and the cyclist in the two situations?

- A. Frequency heard: equal in both situations | Wavelength in air: same in both situations
 - B. Frequency heard: greater in situation 1 | Wavelength in air: same in both situations
 - C. Frequency heard: equal in both situations | Wavelength in air: shorter in situation 1
 - D. Frequency heard: greater in situation 1 | Wavelength in air: shorter in situation 1
24. Two moons, X and Y, orbit the same planet in circular orbits. The mass of Y is twice the mass of X. The orbital radius of Y is four times the orbital radius of X.

What is the ratio of the orbital period of Y to the orbital period of X?

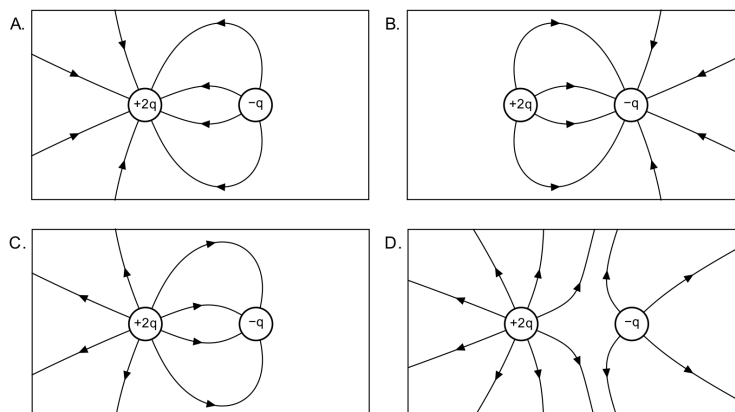
- A. 8
- B. 2
- C. $4\sqrt{2}$
- D. 4

25. The diagram shows the gravitational field lines and four equipotential surfaces, drawn as dashed lines, around a planet. The surfaces are drawn at equal intervals of gravitational potential.



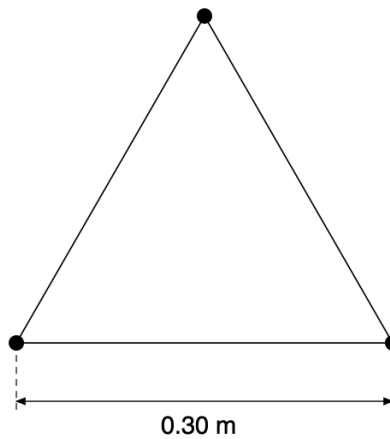
Which statement explains the spacing of the equipotential surfaces?

- A. The field lines are perpendicular to the equipotential surfaces.
 - B. The gravitational field strength decreases with distance from the planet.
 - C. The gravitational potential increases with distance from the planet.
 - D. No work is done when a mass moves along an equipotential surface.
26. Point charges $+2q$ and $-q$ are fixed a distance apart, with $+2q$ on the left.



Which diagram shows the electric field lines of the two charges?

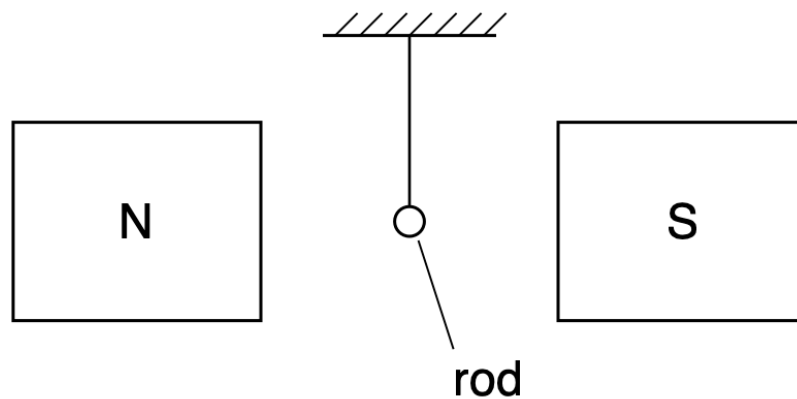
27. Three identical point charges are brought from infinity and fixed at the corners of an equilateral triangle, as shown. The electric force exerted by one charge on another is 0.40 N.



What is the work done in bringing the three charges from infinity to these positions?

- A. 0.12 J
 - B. 0.24 J
 - C. 0.36 J
 - D. 0.72 J
28. A proton enters a region of uniform magnetic field at right angles to the field. The proton moves in a circular path. An electron then enters the same field at the same point with the same velocity.
- How does the path of the electron compare with the path of the proton?
- A. Radius of path: Smaller | Sense of rotation: Opposite
 - B. Radius of path: Larger | Sense of rotation: Opposite
 - C. Radius of path: Smaller | Sense of rotation: Same
 - D. Radius of path: Larger | Sense of rotation: Same

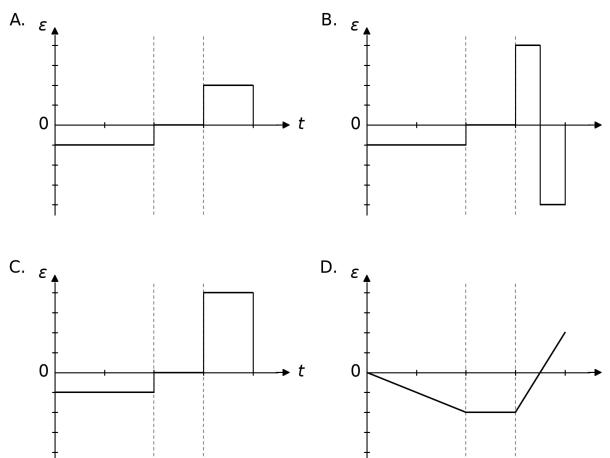
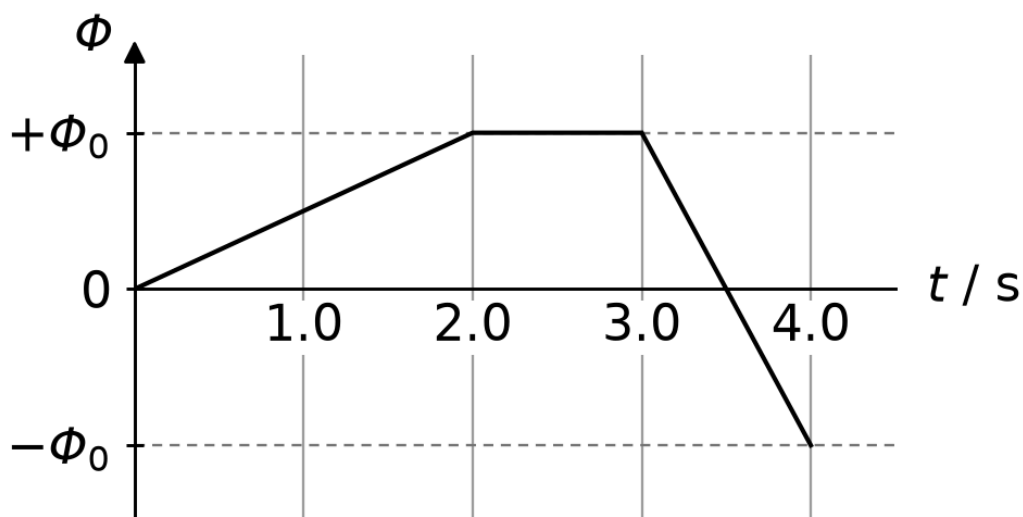
29. A metal rod of length 0.050 m is suspended by two wires between the poles of a magnet. The diagram shows the rod, which is perpendicular to the plane of the page. The magnetic field is uniform with a magnetic field strength of 0.20 T. The rod is entirely within the field. The mass per unit length of the rod is 0.040 kg m^{-1} .



The current in the rod is adjusted until the tension in the wires is zero. What are the magnitude and the direction of the current in the rod?

- A. Current: 2.0 A | Direction: into the page
- B. Current: 2.0 A | Direction: out of the page
- C. Current: 39 A | Direction: out of the page
- D. Current: 39 A | Direction: into the page

30. The graph shows the variation with time t of the magnetic flux Φ through a coil.



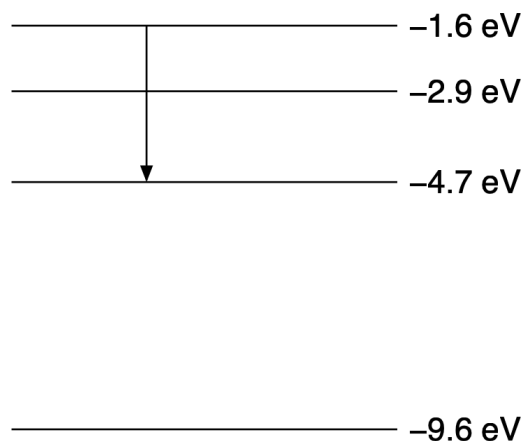
Which graph shows the variation with t of the emf ϵ induced in the coil?

- A. Graph A
 B. Graph B
 C. Graph C
 D. Graph D
31. A square coil of side 4.0 cm rotates at a constant frequency in a uniform magnetic field. The axis of rotation lies in the plane of the coil and is perpendicular to the field. The period of rotation is 20 ms and the peak emf induced in the coil is 8.0 V. The coil is replaced by a square coil of side 6.0 cm with the same number of turns. The new coil rotates in the same field, about the same axis, with a period of 10 ms.

What is the peak emf induced in the new coil?

- A. 9 V
 B. 18 V
 C. 24 V
 D. 36 V

32. The diagram shows four energy levels of an atom. The arrow represents an electron transition between two of the levels.



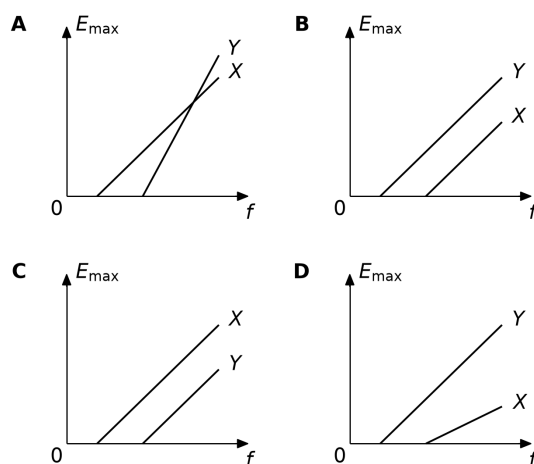
What is the wavelength of the photon emitted?

- A. $2.0 \times 10^{-7} \text{ m}$
B. $2.6 \times 10^{-7} \text{ m}$
C. $4.0 \times 10^{-7} \text{ m}$
D. $9.5 \times 10^{-7} \text{ m}$
33. In the Bohr model of the hydrogen atom, the radius of the $n = 1$ orbit of the electron is r_1 . The mass of the electron is m .

What is the speed of the electron in the $n = 3$ orbit?

- A. $3h/(2\pi m r_1)$
B. $h/(6\pi m r_1)$
C. $h/(2\pi m r_1)$
D. $h/(18\pi m r_1)$

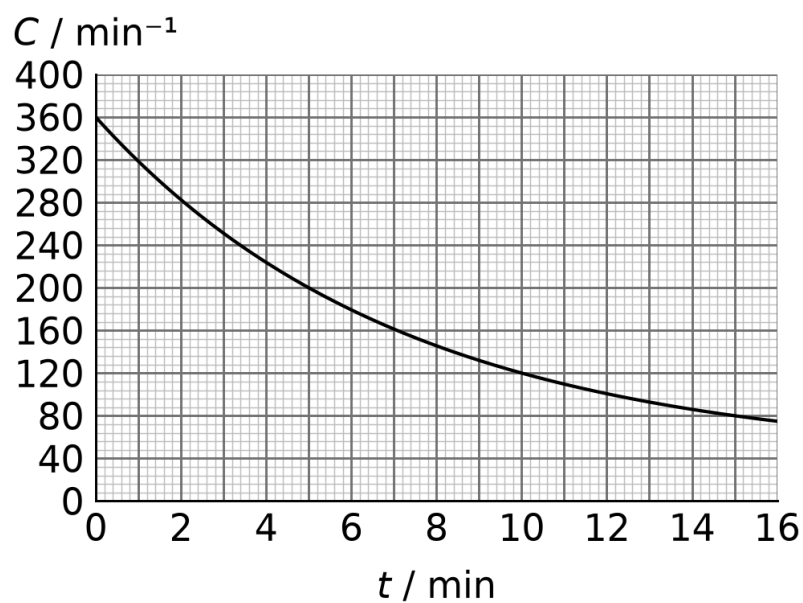
34. Electromagnetic radiation of frequency f is incident on the surface of metal X and on the surface of metal Y. The work function of X is less than the work function of Y.



Which graph shows the variation with f of the maximum kinetic energy $E_{\max}$ of the electrons emitted from X and from Y?

- A. Graph A
 - B. Graph B
 - C. Graph C
 - D. Graph D
35. Electrons are accelerated from rest through a potential difference. The electrons are then incident on a thin film of graphite. A pattern of concentric rings is observed on a fluorescent screen.
- The accelerating potential difference is increased. The positions of the film and the screen are unchanged. What does the pattern provide evidence for, and what happens to the radius of each ring?
- A. Evidence for: wave nature of electrons | Radius of each ring: increases
 - B. Evidence for: particle nature of electrons | Radius of each ring: decreases
 - C. Evidence for: particle nature of electrons | Radius of each ring: increases
 - D. Evidence for: wave nature of electrons | Radius of each ring: decreases

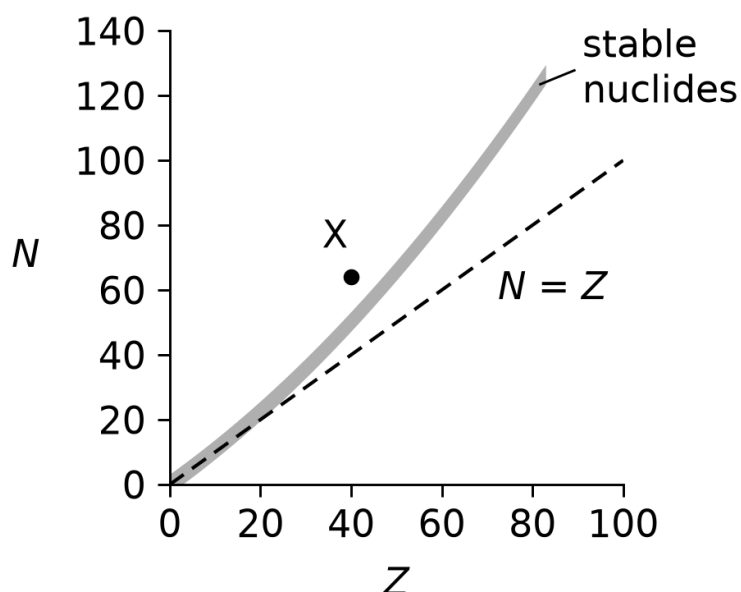
36. A radioactive source contains a single radioactive nuclide that decays into a stable nuclide. A detector is placed near the source. The graph shows the variation with time t of the count rate C recorded by the detector. The background count rate is 40 min^{-1} .



What is the half-life of the nuclide?

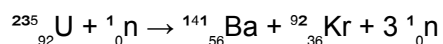
- A. 5.0 min
- B. 6.0 min
- C. 7.1 min
- D. 8.4 min

37. The graph shows the number of neutrons N against the number of protons Z for stable nuclides. The dashed line shows $N = Z$. An unstable nuclide X is marked on the graph.



Which row identifies the decay that X undergoes and the changes in N and in Z ?

- A. Decay: β^+ | Change in N : +1 | Change in Z : -1
 B. Decay: β^- | Change in N : -1 | Change in Z : +1
 C. Decay: β^- | Change in N : +1 | Change in Z : -1
 D. Decay: β^+ | Change in N : -1 | Change in Z : +1
38. A nucleus of uranium-235 absorbs a slow-moving neutron and undergoes fission according to the equation



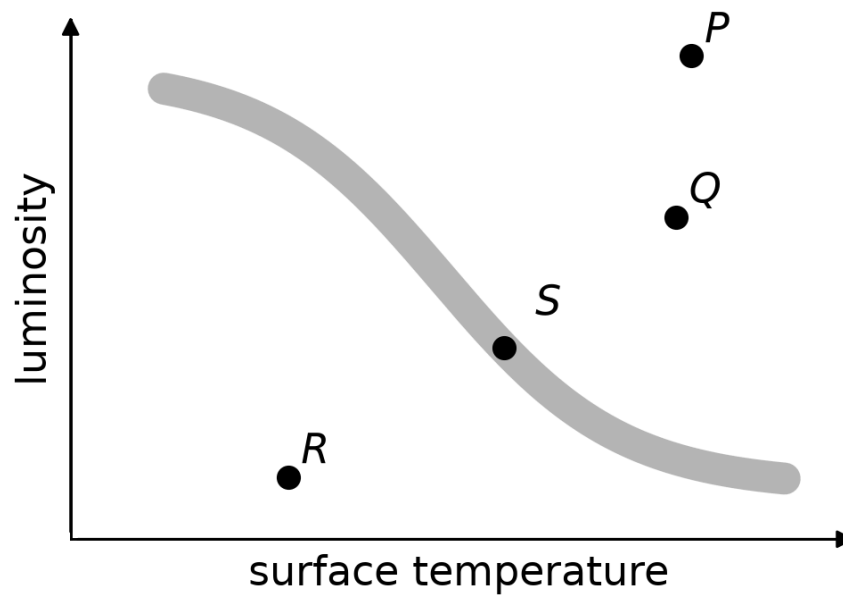
The binding energy per nucleon is 7.59 MeV for uranium-235, 8.33 MeV for barium-141 and 8.51 MeV for krypton-92.

What is the energy released in this fission?

- A. 166 MeV
 B. 174 MeV
 C. 189 MeV
 D. 195 MeV
39. Two stars, X and Y , radiate as black bodies. The luminosity of X is four times the luminosity of Y . The surface temperature of X is half the surface temperature of Y .
- What is the ratio radius of X / radius of Y ?

- A. 1/8
 B. 1/2
 C. 8
 D. 64

40. The Hertzsprung–Russell (HR) diagram shows four positions P, Q, R and S. The Sun is at present on the main sequence at S.



Which position represents the Sun when it becomes a red giant, and what is the final remnant of the Sun?

- A. Position: Q | Final remnant: white dwarf
- B. Position: Q | Final remnant: neutron star
- C. Position: P | Final remnant: white dwarf
- D. Position: P | Final remnant: neutron star

Want the mark scheme?

This paper is free to use and free to share. The full mark scheme for Paper 1A — with the marking points, the accepted alternatives and the examiner notes on what does *not* earn the mark — is at the link below, along with the mark schemes for the rest of the predicted set.

Get the mark schemes at

fenwicktutoring.com/november-2026-physics-exam

Stuck on any of this?

I have taught IB Physics for ten years and I teach it one to one, online. If a question here caught you out, that is exactly the kind of thing a few lessons before November will fix — whether you are aiming to move a 5 to a 6 or to secure a 7, get in touch.

Book a free introductory lesson at

fenwicktutoring.com/contact

Written by James Fenwick, Fenwick Tutoring. More free practice papers and revision simulations at fenwicktutoring.com.