ZIMSEC
For Performance Measurement

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Advanced Level

PHYSICS 6032/1

PAPER 1 Multiple Choice

Specimen Paper 1 hour

Additional materials:
Multiple Choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)
Electronic calculator and/or Mathematical tables

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Do not open this booklet until you are told to do so.
Write your name, Centre number and candidate number on the answer sheet in the spaces provided unless this has already been done for you.

There are **forty** questions in this paper. Answer **all** questions. For each question there are four possible answers, **A**, **B**, **C** and **D**. Choose the **one** you consider correct and record your choice
in **soft pencil** on the separate answer sheet.

Read very carefully the instructions on the answer sheet.

INFORMATION FOR CANDIDATES

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

This specimen consists of 15 printed pages and 1 blank page.

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DATA

speed of light in free space	$c = 3.00 \times 10^{8} ms^{-1}$
permeability of free space	$\mu_o = 4\pi \times 10^{-7} Hm^{-1}$
permittivity of free space	$\varepsilon_0 = 8.85 \times 10^{-12} Fm^{-1}$ $(1/4\pi\varepsilon_0 = 8.99 \times 10^{9} mF^{-1})$
elementary charge	$e = 1.60 \times 10^{-19} C$
the Planck constant	$h = 6.63 \times 10^{-34} Js$
unified atomic mass unit	$1 u = 1.66 \times 10^{-27} kg$
rest mass of electron	$m_e = 9.11 \times 10^{-31} kg$
rest mass of proton	$m_p = 1.67 \times 10^{-27} kg$
molar gas constant	$R = 8.31 JK^{-1}mol^{-1}$
the Avogadro constant	$N_A = 6.02 \times 10^{23} mol^{-1}$
the Boltzmann constant	$k = 1.38 \times 10^{-23} JK^{-1}$
gravitational constant	$G = 6.67 \times 10^{-11} Nm^2kg^{-2}$
acceleration of free fall	$g = 9.81 ms^{-2}$

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FORMULAE

uniformly accelerated motion $s = ut + \frac{1}{2}at^2$

$v^2 = u^2 + 2as$

work done on/by a gas $W = p\,\Delta V$

gravitational potential $\phi = -Gm/r$

hydrostatic pressure $p = \rho gh$

pressure of an ideal gas $p = \frac{1}{3}\frac{Nm}{V} < c^2 >$

simple harmonic motion $a = -\omega^2 x$

velocity of particle in s.h.m. $v = v_o \cos \omega t$

$v = \pm\omega\sqrt{(x_o^2 - x^2)}$

Doppler effect $f_o = \frac{f_s v}{v \pm v_s}$

Attenuation of xrays $I = I_o e^{-\mu x}$

electric potential $V = \frac{Q}{4\pi\varepsilon_0 r}$

capacitors in series $1/C = 1/C_1 + 1/C_2 + \ldots$

capacitors in parallel $C = C_1 + C_2 + \ldots$

energy of charged capacitor $W = \frac{1}{2}QV$

electric current $I = Anvq$

resistors in series $R = R_1 + R_2 + \ldots$

resistors in parallel $1/R = 1/R_1 + 1/R_2 + \ldots$

Hall voltage $V_H = \frac{BI}{ntq}$

alternating current/voltage $x = x_o \sin\omega t$

radioactive decay $x = x_o \exp(-\lambda t)$

decay constant $\lambda = \frac{0.693}{t_{\frac{1}{2}}}$

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1 The pressure, P of an ideal gas in a sealed container is given by:

$$P = \frac{1}{3}\rho < C^2 >,$$

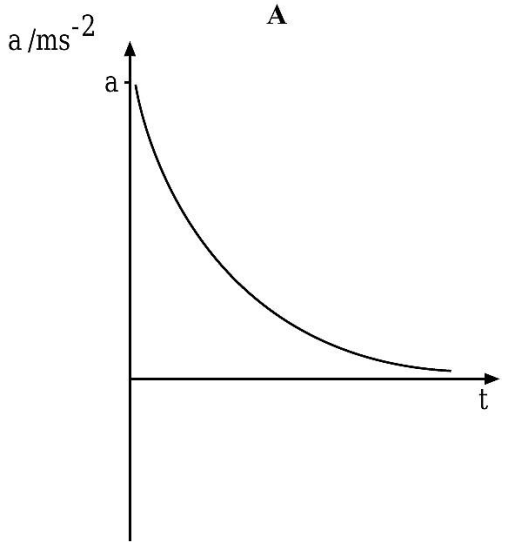
where ρ is density and **C** is the speed of gas molecules.

If the percentage uncertainty in the mean square speed is 0.6%, what is the percentage uncertainty in ρ?

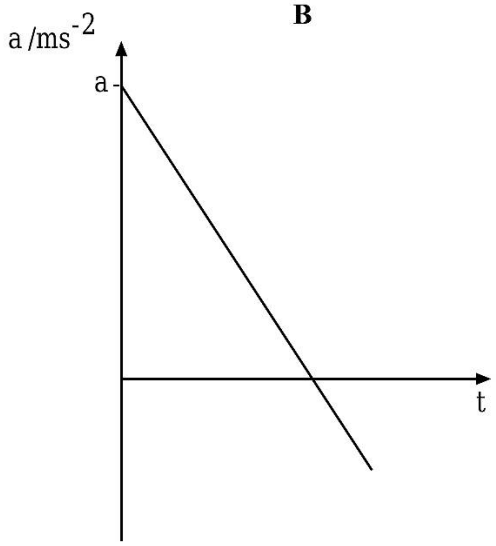
A 0.30%
B 0.36%
C 0.60%
D 1.20%

2 A ball is dropped from a tall building and is allowed to fall freely. Which graph shows how the acceleration, a varies with time, t?

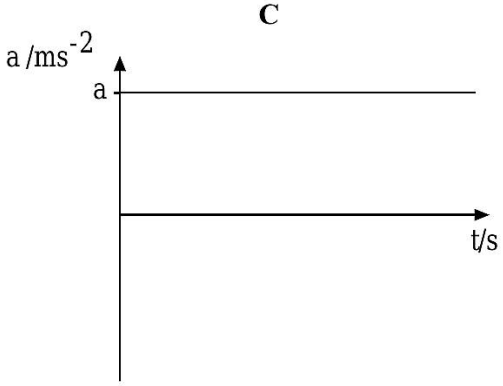
A



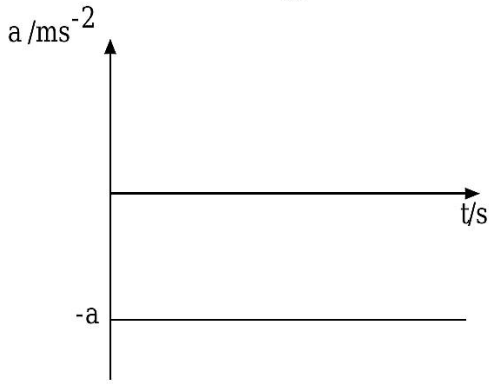
B



C



D

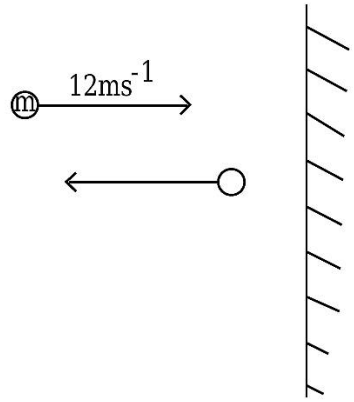


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3 A train is travelling at a speed of $30ms^{-1}$ along a straight path. A person who is in the train walks along the passage towards the rear of the train at a speed of $2ms^{-1}$ relative to the train. What is the boy's speed relative to the earth?

A $15ms^{-1}$
B $28ms^{-1}$
C $32ms^{-1}$
D $60ms^{-1}$

4 A tennis ball of mass 45g was struck by a racket and moved off with a velocity of $12ms^{-1}$. It then hit the surface and re-bounced as in the diagram.



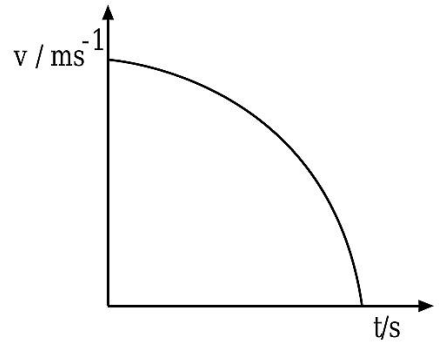
If it was in contact with the surface for 15ms, what is the fore exerted by the surface on the ball?

A 31N
B 36N
C 62 N
D 72 N

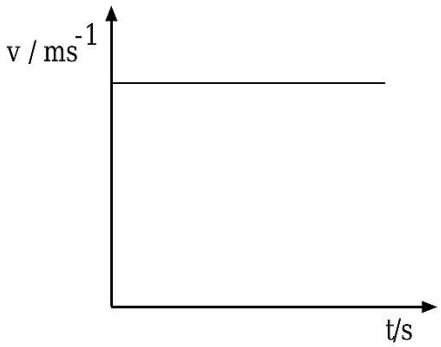
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5 Which graph shows a particle that has attained terminal velocity?

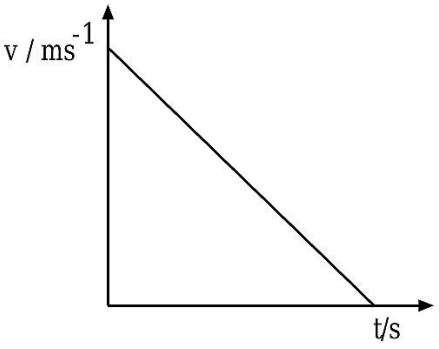
A



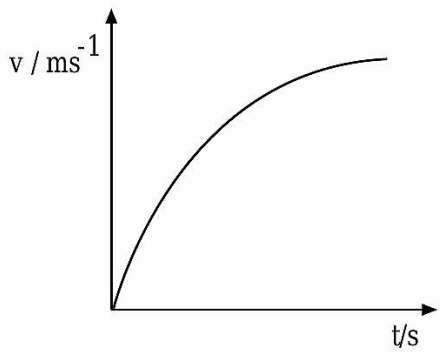
B



C



D



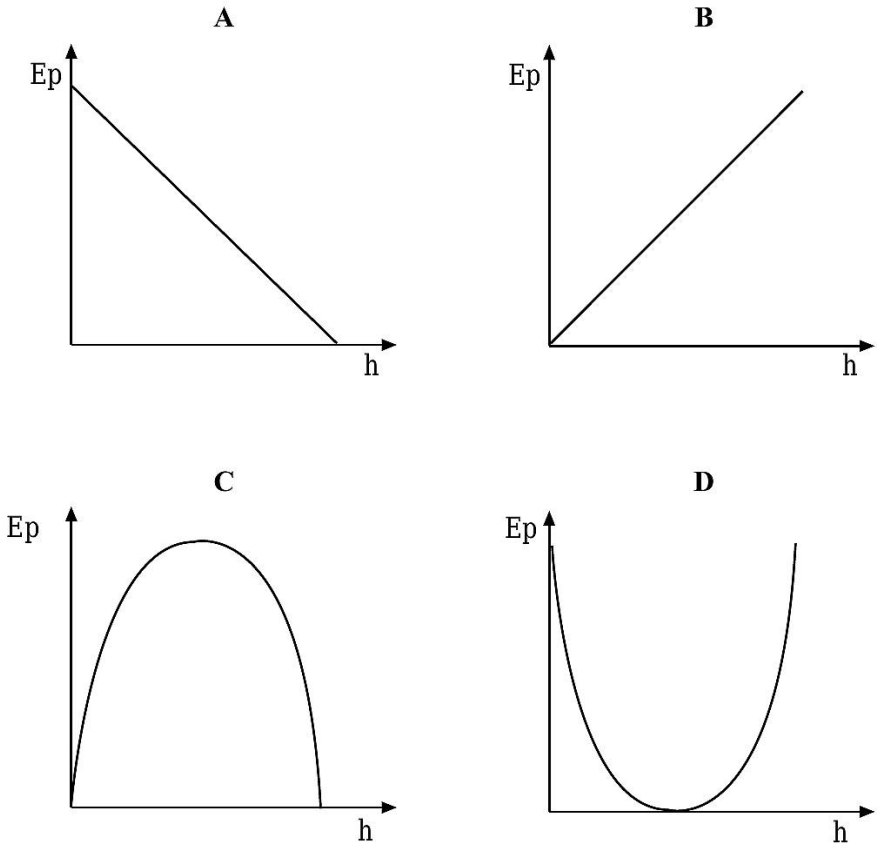
6 During the launch of a rocket, it produced propellant gases at a rate of $1000kgs^{-1}$ so that a speed of 45km/s is attained.

What is the thrust of the rocket at that speed?

A $45 \times 10^3 N$
B $45 \times 10^5 N$
C $45 \times 10^6 N$
D $45 \times 10^7 N$

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7 Which graph shows the variation of gravitational potential energy, E_p, with height, h, for a stone thrown vertically upwards?



8 A bob of mass 2M is whirled in a horizontal circle of radius, r with a constant angular speed ½ ω.

What is the work done by the body in one revolution?

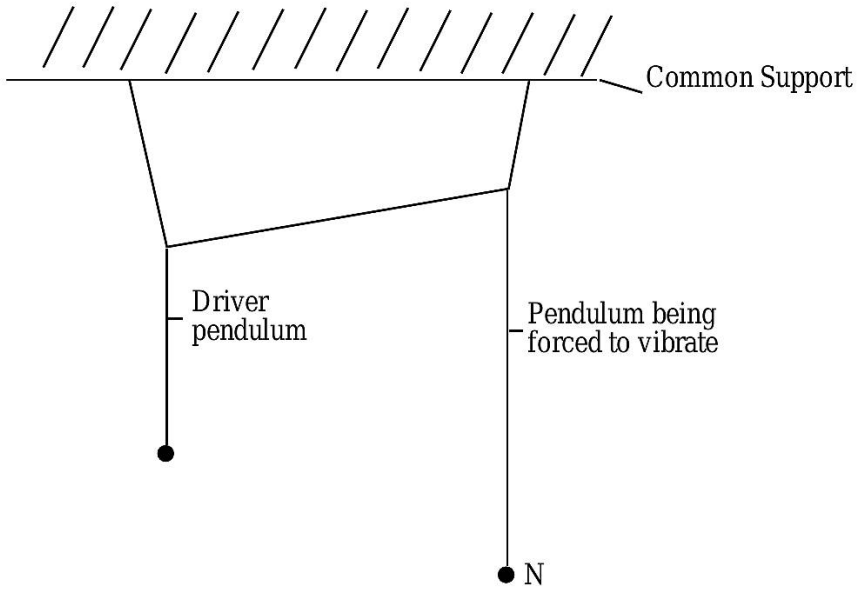
A zero
B $\frac{1}{2} Mr^2\omega^2$
C $Mr^2\omega^2$
D $2\pi Mr^2\omega^2$

9 Which of the following is a characteristic of an orbiting geostationary satellite?

A same acceleration as the earth
B same radius of rotation as that of the earth
C same speed as the earth
D same period as the earth

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10 The diagram shows Barton's pendulums used to investigate forced vibrations.



Which statement is **not** correct at resonance?

A The amplitude of vibration of N depends on the frequency of the driver pendulum.
B N vibrates at the same frequency as the driver pendulum.
C The phase difference N and the driver pendulum is zero.
D N and the driver pendulum will have some amplitude.

11 When a particle performs simple harmonic motion the velocity leads the displacement by a phase angle of

A $\frac{\pi}{4}$
B $\frac{\pi}{2}$
C $\frac{3\pi}{4}$
D π

12 The buzz of a bee is caused by Oscillations of the insect's wings at a frequency of 75Hz. The amplitude of the oscillation of the tip of a bee's wing is 1,0 cm. What is the maximum speed of the tip of the wing? (Assume the oscillations are simple harmonic).

A 0. 047 ms^{-1}
B 0.47 ms^{-1}
C 4,7 ms^{-1}
D 47 ms^{-1}

13 The length of a tube is adjusted until the sound wave set up in it is loudest. What is the nature of the sound wave in the tube?

A Transverse and progressive
B Longitudinal and progressive
C Transverse and stationery
D Longitudinal and stationery

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14 Which scan uses ionising radiation?

A X-ray shadow imaging
B magnetic resonance imaging
C ultrasound B scan
D ultrasound A scan

15 A parallel beam of white light is incident normally on a diffraction grating. It is noted that the second-order and third-order spectra partially overlap. Which wavelength in the third-order spectrum appears at the same angle as the wavelength of 600 nm in the second-order spectrum?

A 300 nm
B 400 nm
C 600 nm
D 900 nm

16 The attenuation (absorption) coefficient of bone is $600m^{-1}$ for x-rays of energy 20KeV. A beam of such x-rays has an intensity of $20Wm^{-2}$.

What is the intensity of the beam after passing through a 4.0 mm thickness of bone?

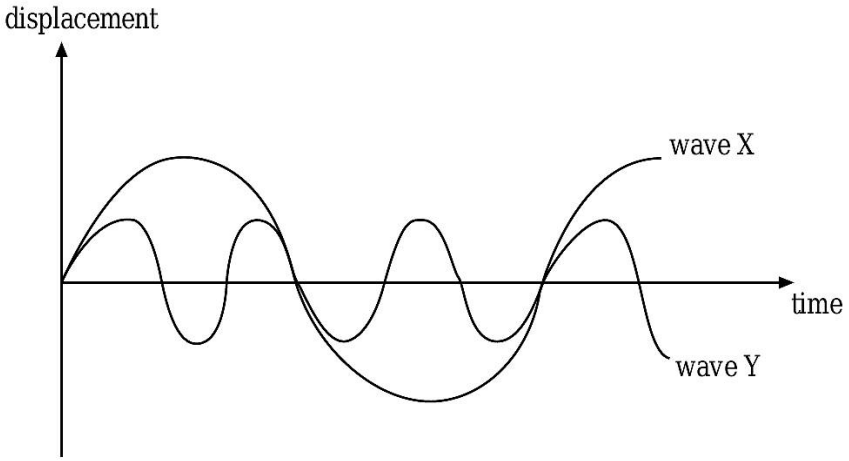
A $0.004\ Wm^{-2}$
B $0.08\ Wm^{-2}$
C $1.8\ Wm^{-2}$
D $4.0\ Wm^{-2}$

17 Which one has the lowest energy?

A Infra-red
B microwaves
C Ultra-violet
D X-rays

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18 The diagram shows two waves X and Y drawn to scale.



Wave X has amplitude of 8cm and frequency 100Hz. What are the amplitude and frequency of wave Y?

	amplitude/cm	frequency/Hz
A	2	33
B	2	300
C	4	33
D	4	300

19 The frequency f of the waves is adjusted until a stationary wave is formed with antinode nearest the wall at a distance, x from the wall. Which expression gives f in terms of x and the speed of wave, C?

A. $f = \frac{4c}{x}$

B. $f = \frac{C}{4x}$

C. $f = \frac{2c}{x}$

D. $f = \frac{c}{x}$

20 A solid sphere whose charge is distributed uniformly throughout

A is not made of metal.
B has an electric field of zero everywhere inside the sphere.
C has an electric potential of zero in the centre of the sphere.
D does not have a constant electric potential on the surface of the sphere.

21 How should the filament be modified to make a light bulb brighter at a given voltage?

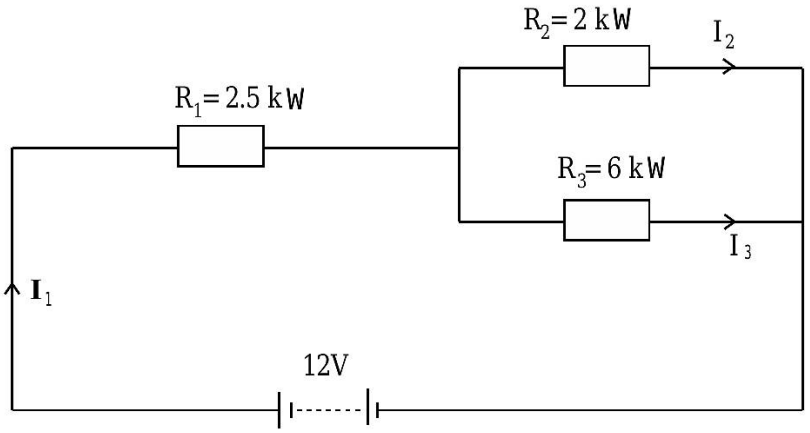
A increase the resistivity only
B increase the diameter only
C decrease the resistivity only
D decrease the diameter only

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22 The resistivity of a material 2m in length with a cross-sectional area of $2mm^2$ and resistance $1.6 \times 10^{-2}\ \Omega$ is

A $1.6 \times 10^{-2}\ \Omega$ m.
B $1.6 \times 10^{-8}\ \Omega$ m.
C $3.2 \times 10^{-8}\ \Omega$ m.
D $6.4 \times 10^{-2}\ \Omega$ m.

23 Which change would increase the value of $\mathbf{I}_1$ for the circuit shown in the diagram?



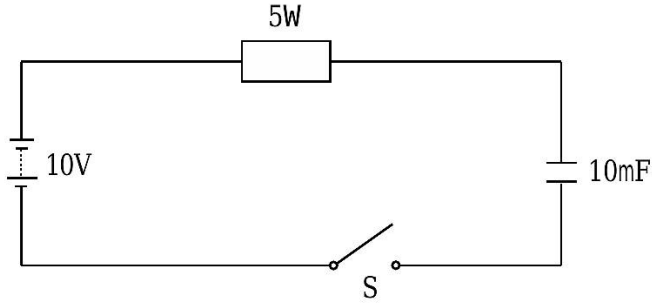
A remove R_3 and its branch
B replace R_2 with another 6kΩ resistor
C put all resistors in series
D add on 8kΩ resistor in parallel with R_2 and R_3

24 A helium nucleus, ${}^{4}_{2}He$, and a lithium nucleus, ${}^{7}_{3}Li$, are accelerated through the same electric potential difference. The ratio of the resultant kinetic energy of the lithium nucleus to that of the helium nucleus is

A 4:7.
B 2:3.
C 3:2.
D 7:4.

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25 The diagram shows a 10μF capacitor being charged.



The energy stored in the capacitor is

A 100 μJ.
B 250 μJ.
C 500 μJ.
D 1000 μJ.

26 Which statement is **not** true about capacitors?

A Capacitors can store charge.
B Capacitors act as a.c. when current passes through.
C Capacitors essentially block d.c. current.
D Capacitors have capacitance values greater than 1F.

27 If the magnetic flux cuts across 200 turns at a rate of 2Wb/s, the induced voltage according to Faraday's Law is

A 100V.
B 200V.
C 400V.
D 600V.

28 Which device does **not** use electromagnetic induction?

A relays
B transformers
C earphones
D electric bells

29 The following improves the efficiency of an electrical transformer **except**

A reduced eddy currents.
B no moving parts.
C small input voltage.
D no direct connection between coils.

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30 If gain without feedback and feedback factor are A and B respectively, then the gain with negative feedback is

A $A/(1-A\beta)$.
B $A/(1+A\beta)$.
C $(1-A\beta)/A$.
D $(1+A\beta)/A$.

31 Air is trapped in a cylinder by a piston. The pressure of the air is P and the length of the air column is 20 cm. When the length of the air column is changed to 40cm, the new air pressure is

A 0.2 P.
B 0.5 P.
C P.
D 2P.

32 When a solid melts

A heat enters the solid.
B heat leaves the solid.
C the temperature of the solid decreases.
D the temperature of the solid increases.

33 Why is there no change in temperature when a substance is melting?

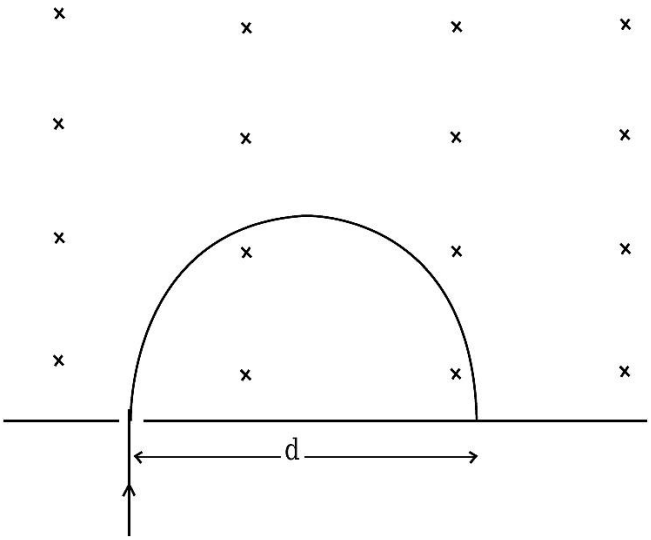
A energy is absorbed during melting
B energy is only lost when the temperature is falling
C latent heat is the source of energy lost to the surroundings
D the specific heat capacity of the substance is zero while it is melting

34 Bernoulli's equation describes a relationship of

A speed, density and flow rate.
B pressure, volume and speed.
C pressure, volume and density.
D pressure, speed and density.

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35 The diagram shows a particle of mass m and charge q moving with a velocity v entering a region of uniform magnetic field B.



What distance from the entrance slit will the particle strike the wall, if the particles remain the same and the mass-charge ratio is doubled?

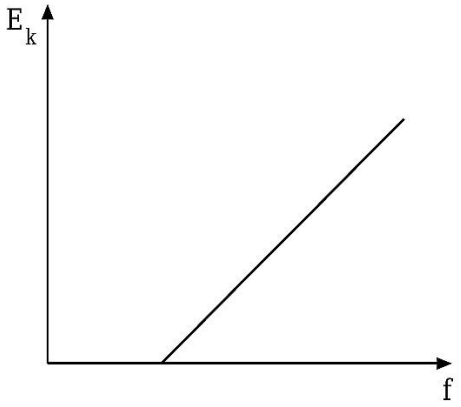
A 2d
B d
C $d/2$
D $d/4$

36 A hydrogen atom is in the ground state when its electron

A is in the middle of the atom.
B is in the innermost orbit.
C has been completely ionised.
D has absorbed a photon .

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37 The graph shows how the maximum kinetic energy, E_k of emitted photoelectrons varies with frequency f of incident radiation.



The slope of the graph is equal to the

A charge of an electron.
B Planck's constant.
C work function of emitter.
D wavelength of emitter.

38 Which is **not** an advantage of amplitude modulation compared to frequency modulation?

A it produces sound of better quality
B one transmitter covers a greater area
C cheaper radio sets can be used
D more stations are available in any frequency range

39 The technique of interleaving different signals is called

A regeneration.
B multiplexing.
C attenuation.
D amplification.

40 Which combination is correct for satellite communication?

	Signal power received from earth	Signal power transmitted to earth
A	Low	Low
B	High	High
C	Low	High
D	High	Low

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