H

NANYANG JUNIOR COLLEGE
JC 2 PRELIMINARY EXAMINATION
Higher 1

CANDIDATE NAME

CLASS

TUTOR'S NAME

PHYSICS

8866/01

Multiple Choice Questions

25 September 2014

1 hour

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write your name and class on the Cover of this Question Paper and on the Answer Sheet provided.

There are **thirty** questions in this section. 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 Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

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.
The use of an approved scientific calculator is expected, where appropriate.

DATA AND FORMULAE

Data

speed of light in free space,	$c = 3.00 \times 10^{8}\ \text{m s}^{-1}$
elementary charge,	$e = 1.60 \times 10^{-19}\ \text{C}$
the Planck constant,	$h = 6.63 \times 10^{-34}\ \text{J s}$
unified atomic mass constant,	$u = 1.66 \times 10^{-27}\ \text{kg}$
rest mass of electron,	$m_e = 9.11 \times 10^{-31}\ \text{kg}$
rest mass of proton,	$m_p = 1.67 \times 10^{-27}\ \text{kg}$
acceleration of free fall.	$g = 9.81\ \text{m s}^{-2}$

Formulae

uniformly accelerated motion,	$s = ut + \frac{1}{2} at^2$
	$v^2 = u^2 + 2as$
work done on/by a gas,	$W = p\Delta V$
hydrostatic pressure,	$p = \rho gh$
resistors in series,	$R = R_1 + R_2 + \ldots$
resistors in parallel.	$1/R = 1/R_1 + 1/R_2 + \ldots$

1 Intensity of a wave *I* at a distance *r* can be determined using the equation

$$I = \frac{P}{4\pi r^2}$$

where *P* is the power of the source.

The fractional error in the measurement of power is *a* and that in the measurement of radius is *b*. What is the fractional error in the calculated value of *I*?

A $a + 2b$ **B** $a - 8\pi b$ **C** $\frac{\Delta a}{a} - 2\frac{\Delta b}{b}$ **D** $\frac{\Delta a}{a} + 2\frac{\Delta b}{b}$

2 A steel rule can be read to the nearest millimetre. It is used to measure the length of a bar whose true length is 103 mm. Repeated measurements give the following readings:

Length / mm 102, 101, 101, 102, 101, 101

Are the readings accurate and precise to within 1 mm?

	results are **accurate** to within 1 mm	results are **precise** to within 1 mm
A	No	No
B	No	Yes
C	Yes	No
D	Yes	Yes

3 Which of the following statements about a front load washing machine is not true?

A The maximum speed of rotation of the drum is 100 revolutions per second.

B The mass of an unloaded machine is 75 kg.

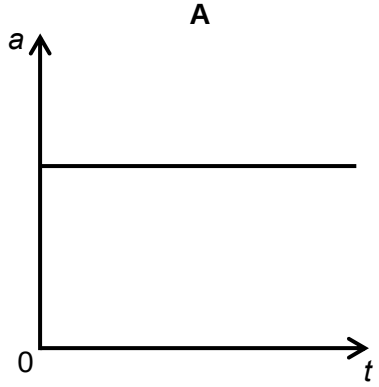
C It occupies 4 x 10^8 mm^3 of space.

D The power consumption of a washing machine is 500 W.

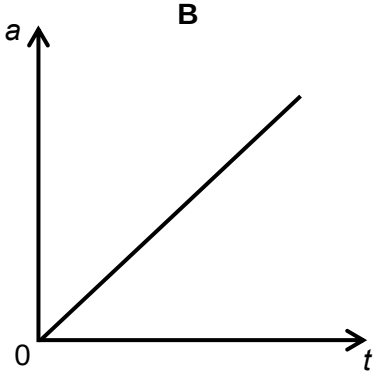
4 A tennis ball is released from rest at the top of a tall building.

Which graph best represents the variation with time *t* of the acceleration *a* of the ball as it falls, assuming that the effects of air resistance are appreciable?

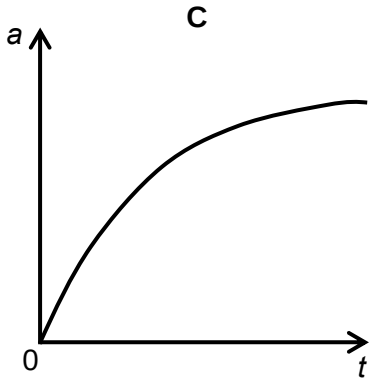
A



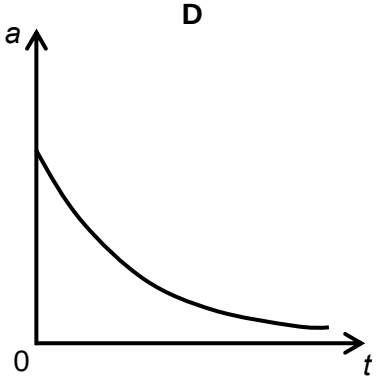
B



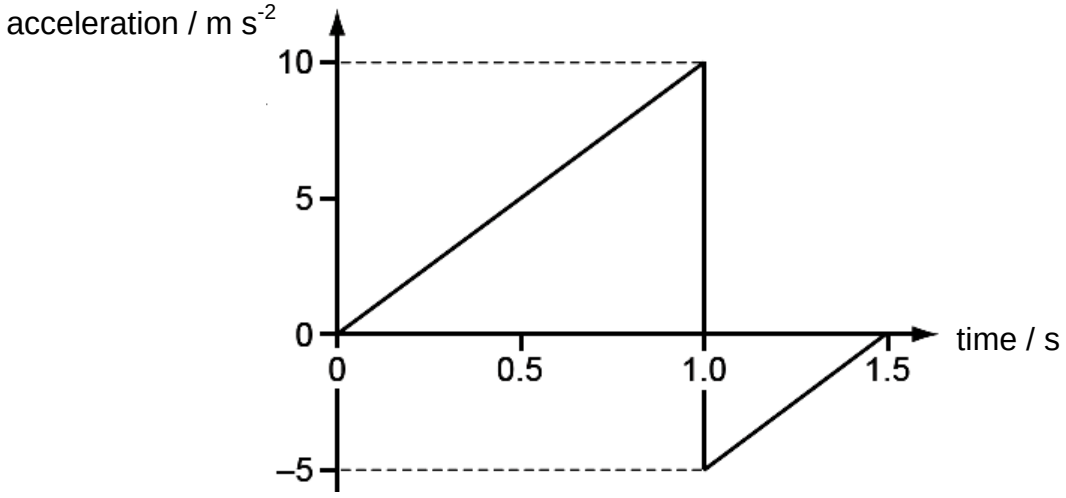
C



D



5 The graph of acceleration against time for an object with an initial velocity of 10.0 m s^{-1} is shown. Initially, the direction of acceleration is opposite to the motion of the object.



What is the speed of the object after 1.25 s?

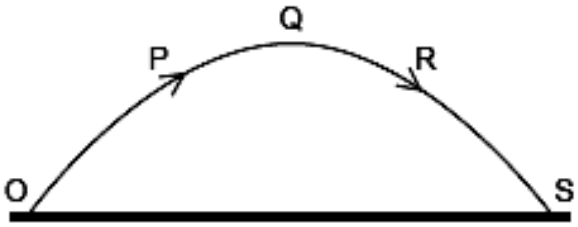
A 5.9 m s^{-1} **B** 6.3 m s^{-1} **C** 13.8 m s^{-1} **D** 14.1 m s^{-1}

6 A hot air balloon carrying a passenger is descending at a constant velocity of 20.0 m s^{-1}. The passenger throws a stone horizontally at 15.0 m s^{-1} and 2.00 s later, the rock strikes the ground.

What is the speed at which the rock strikes the ground?

A 15.0 m s^{-1} **B** 30.0 m s^{-1} **C** 42.4 m s^{-1} **D** 59.6 m s^{-1}

7 A projectile is launched at point O and follows the path OPQRS, as shown.



Which statement is true for the projectile when it is at the highest point Q of its path?

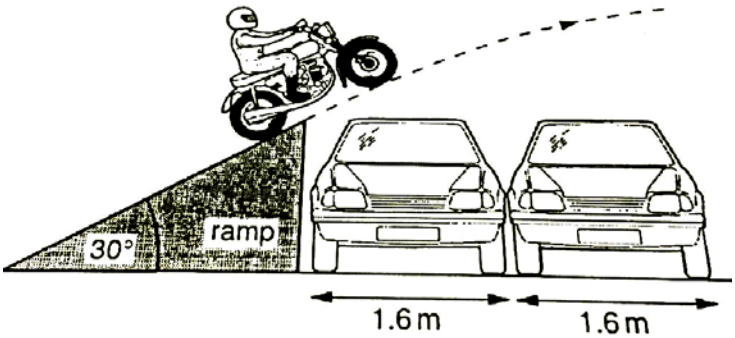
A The horizontal component of the projectile's acceleration is zero.

B The horizontal component of the projectile's velocity is zero.

C The kinetic energy of the projectile is zero.

D The momentum of the projectile is zero.

8 A stuntman on a motorcycle plans to ride up a ramp in order to jump over a number of cars. The speed of the motorcycle as it leaves the ramp is 19 m s^{-1}. The cars are each of width 1.6 m and the same height as the ramp.



What is the maximum number of cars which the motorcyclist can jump across safely?

A 18 **B** 19 **C** 20 **D** 21

9 A 80.0 kg mass falls from a 3.00 m tall ledge down onto the ground. It hits the ground and comes to rest in 0.0250 s. What is the average force exerted by the ground on it?

A 19.6 N **B** 785 N **C** 24 600 N **D** 25 300 N

10 A crate of weight W is being pushed across a horizontal surface by a force directed at an angle of 20° below the horizontal. What correctly describes the magnitude of the normal force on the crate?

A It depends on the speed of the crate.

B It is equal to W.

C It is less than W.

D It is more than W.

11 Two similar spheres, each of mass *m* and travelling with speed *v*, are moving towards each other. The spheres have a head-on elastic collision.

Which of the following statements is correct?

A The spheres stick together on impact.

B The total kinetic energy after impact is mv^2.

C The total kinetic energy before impact is zero.

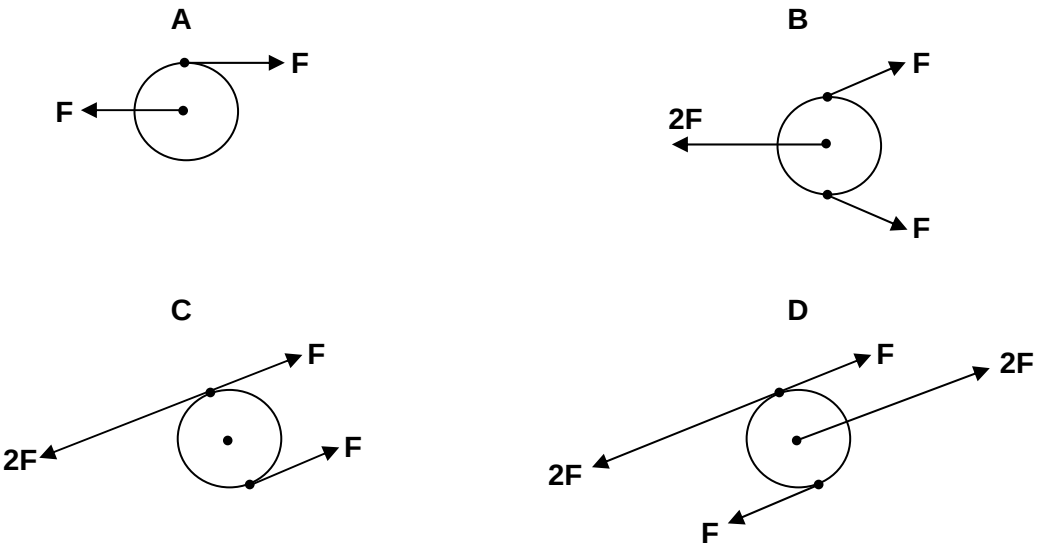
D The total momentum before impact is $2mv$.

12 Object A has twice the mass of object B. Given that both objects have the same magnitude of momentum, the ratio of kinetic energy of B to that of A is

A 0.707 **B** 1 **C** 2 **D** 4

13 An isolated circular disc is subjected to forces as shown in the diagrams below.

In which situation is the disc in static equilibrium?



14 What is **not** true of two forces that give rise to a couple?

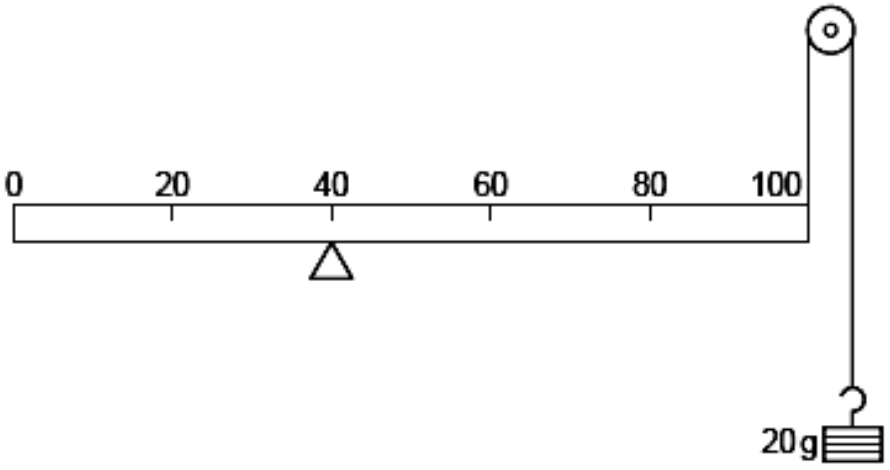
A They act in opposite directions.

B They both act at the same point.

C They both act on the same body.

D They both have the same magnitude.

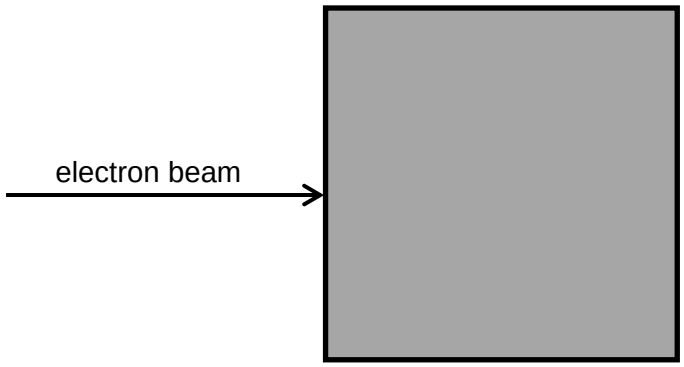
15 A uniform metre rule of mass 100 g is supported by a pivot at the 40 cm mark and a string at the 100 cm mark. The string passes round a frictionless pulley and carries a mass of 20 g as shown in the diagram.



At which mark on the rule must a 50 g mass be suspended so that the rule balances?

A 4 cm **B** 36 cm **C** 44 cm **D** 64 cm

16 In the diagram, the shaded area represents a uniform electric field directed at right-angles into the plane of the paper.



A horizontal beam of electrons enters the field, travelling from left to right.

In which direction is this beam deflected by the field?

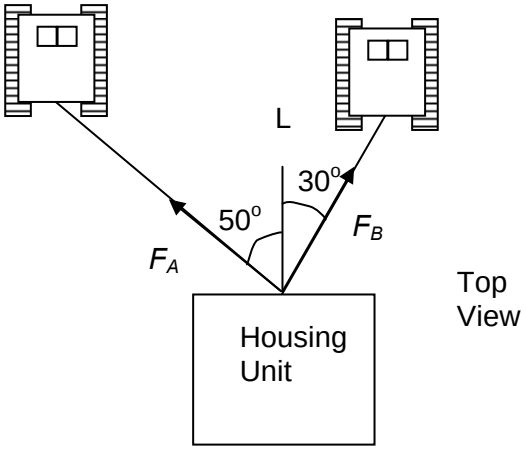
A Upwards

B Downwards

C Out of the plane of the paper

D Into the plane of the paper

17 Two snow-trucks tow a housing unit at constant speed to a new location in the Antarctica as shown below. The sum of forces F_A and F_B exerted on the unit by the horizontal cables is parallel to the line L, and F_A = 4500 N. Determine F_B.



A 1700 N **B** 2500 N **C** 6900 N **D** 9000 N

18 A particle is dropped from rest at a height *h* above the surface of a viscous liquid column of height 0.80 m. It attains a speed of 7.5 ms^{-1} after it has penetrated 0.60 m of the viscous liquid column. If the mass of the particle is 0.80 kg and the viscous liquid offers a constant retarding force of 120 N, what is the height, *h*, from which the particle is released?

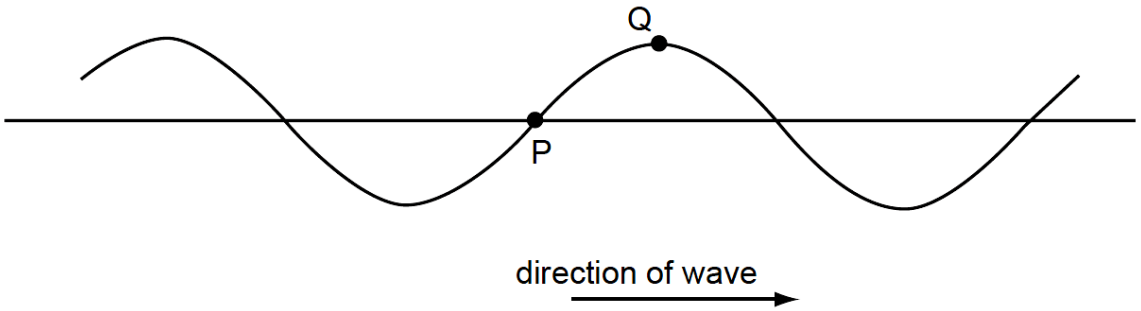
A 2.3 m **B** 3.5 m **C** 11.4 m **D** 15.7 m

19 An object of mass 400 kg is lifted through a vertical height of 1200 m in 2.0 minutes by an electric motor. What is the amount of electrical power needed if the overall efficiency of the system is 80%?

A 3.1 kW **B** 4.9 kW **C** 49 kW **D** 2900 kW

20 The diagram shows a transverse wave on a rope. The wave is travelling from left to right.

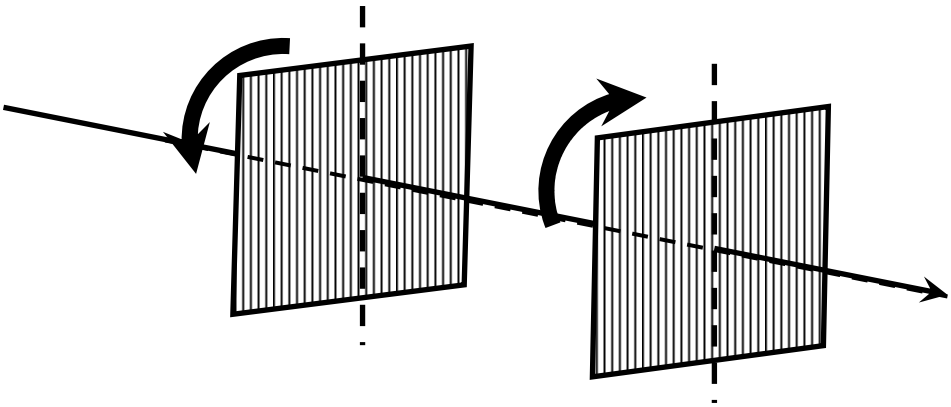
At the instant shown, the points P and Q on the rope have zero displacement and maximum displacement respectively.



Which of the following describes the direction of motion, if any, of the points P and Q at this instant?

	point P	point Q
A	to the right	to the right
B	downwards	stationary
C	upwards	downwards
D	downwards	downwards

21 The diagram shows a beam of initially unpolarised light passing through two Polaroid filters.



The transmitting axes of these filters are initially aligned. The two filters are now rotated through 360^{o} in opposite directions to their own plane at equal speed.

How many maxima of intensity occur in the light emerging from the right-hand Polaroid?

A 2 **B** 3 **C** 5 **D** 9

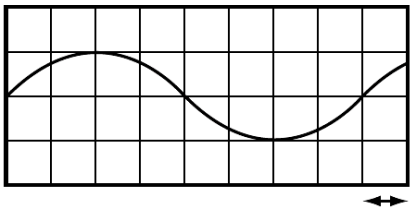
22 A standing sound wave is set up between a loudspeaker and a wall.

A microphone is connected to a cathode-ray oscilloscope (c.r.o.) and is moved along a line directly between the loudspeaker and the wall. The amplitude of the trace on the c.r.o. rises to a maximum at a position X, falls to a minimum and then rises once again to a maximum at a position Y.

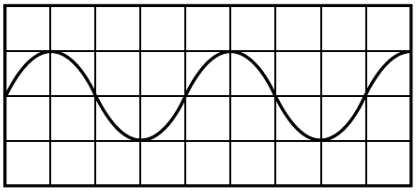
The distance between X and Y is 33 cm. The speed of sound in air is 330 m s^{-1}.

Which diagram represents the c.r.o. trace of the sound received at X?

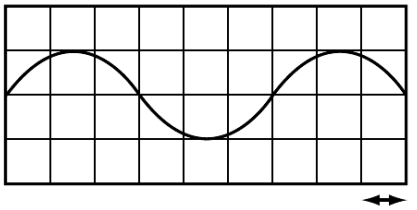
A



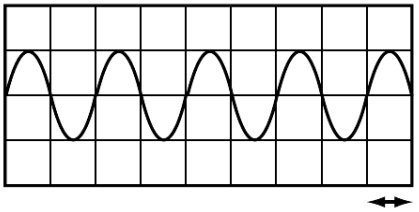
B



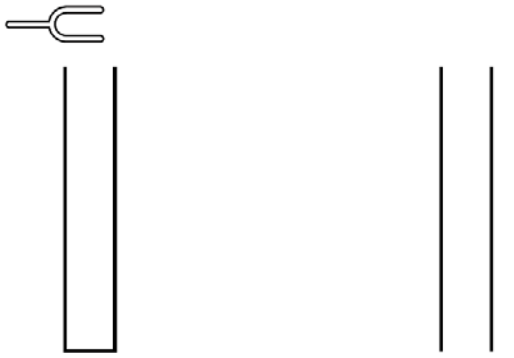
C



D



23 The diagram shows two tubes.



The tubes are identical except tube X is closed at its lower end while tube Y is open at its lower end.

A tuning fork placed above tube X causes resonance of the air at frequency *f*. No resonance is found at any lower frequency.

Which tuning fork will produce resonance when placed just above tube Y?

A A fork of frequency $\frac{f}{2}$

B A fork of frequency $\frac{2f}{3}$

C A fork of frequency $\frac{3f}{2}$

D A fork of frequency $2f$

24 When the light from two lamps falls on a screen, no interference pattern can be obtained.

Why is this so?

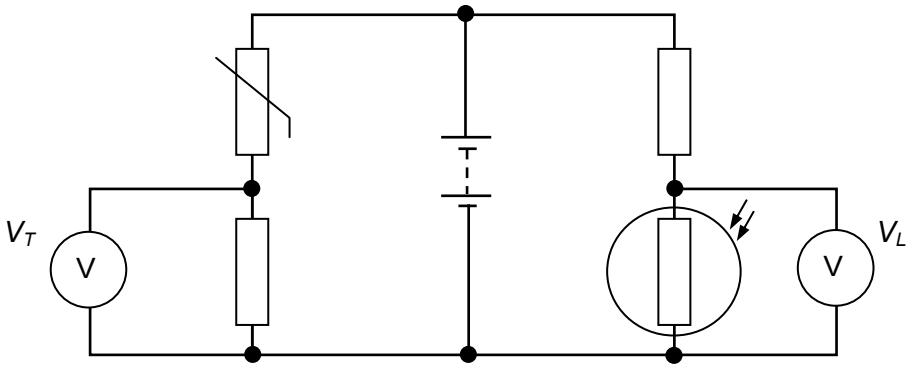
A The light from the lamps is not coherent.

B The lamps emit light of different amplitudes.

C The lamps are not point sources.

D The light from the lamps is white.

25 In the circuit below, the reading V_T on the voltmeter changes from high to low as the temperature of the thermistor changes. The reading V_L on the voltmeter changes from high to low as the level of light on the light-dependent resistor (LDR) changes. It is given that the resistance of the LDR increases as intensity of light incident on it decreases.

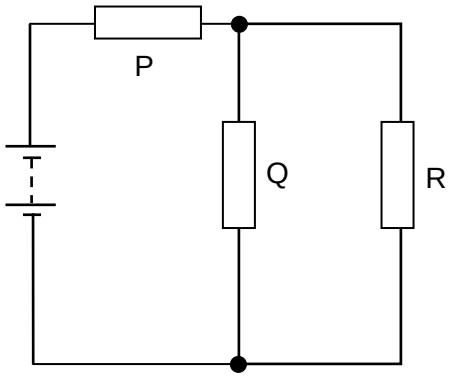


The readings V_T and V_L are both high.

What are the conditions of temperature and light level?

	temperature	light level
A	high	high
B	high	low
C	low	high
D	low	low

26 The resistors P, Q and R in the circuit have equal resistance.

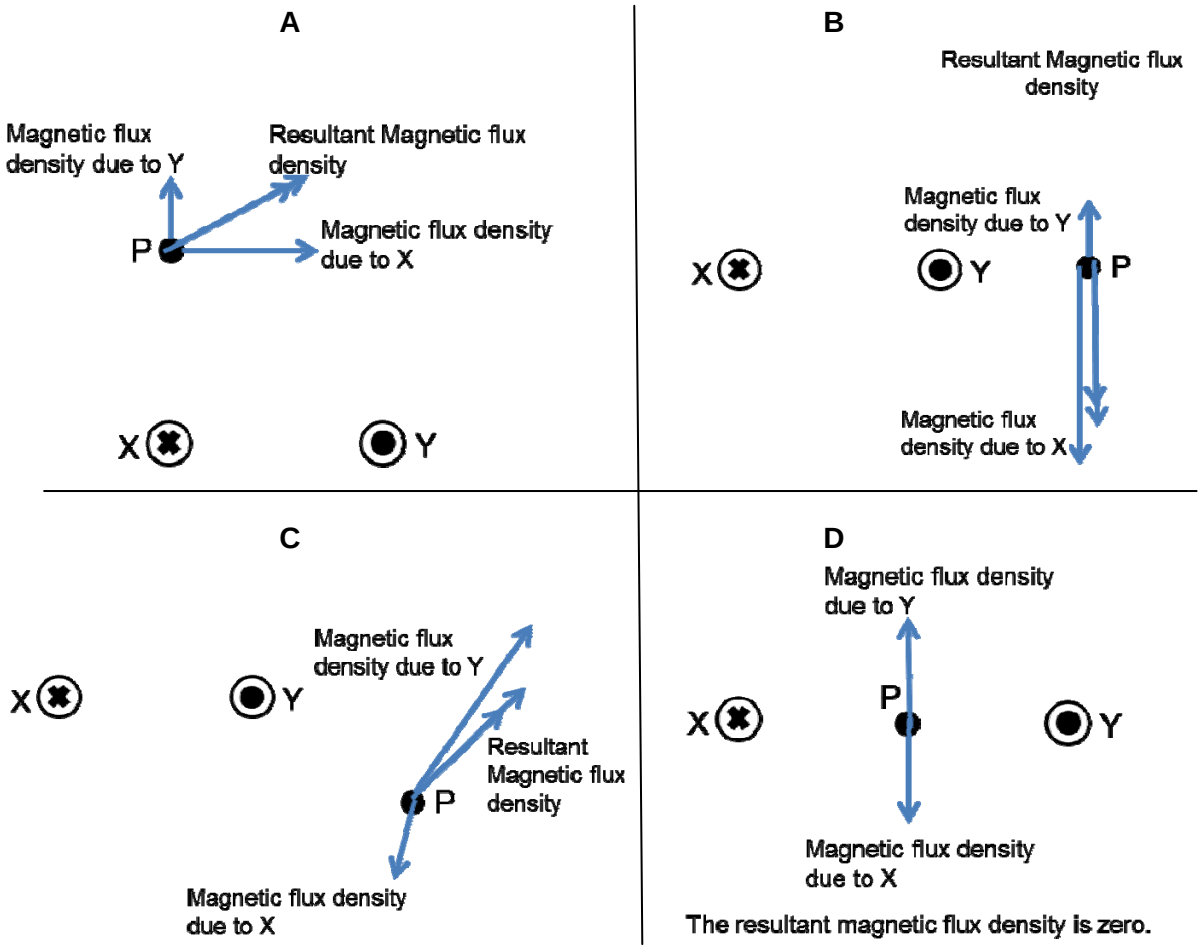


The battery, of negligible internal resistance, supplies a total power of 12 W.

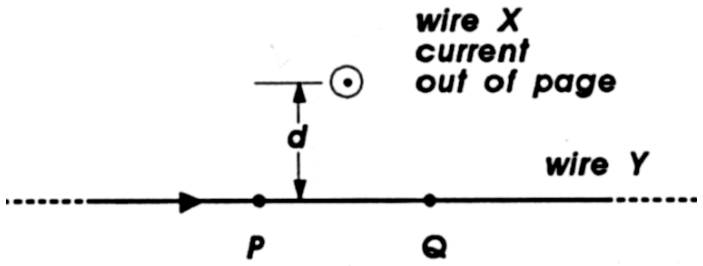
What is the power dissipated by heating in resistor R?

A 2 W **B** 3 W **C** 4 W **D** 6 W

27 Two conductors, X and Y, carry the same amount of current *I*. Which of the following correctly represent the resultant magnetic field density at point P?

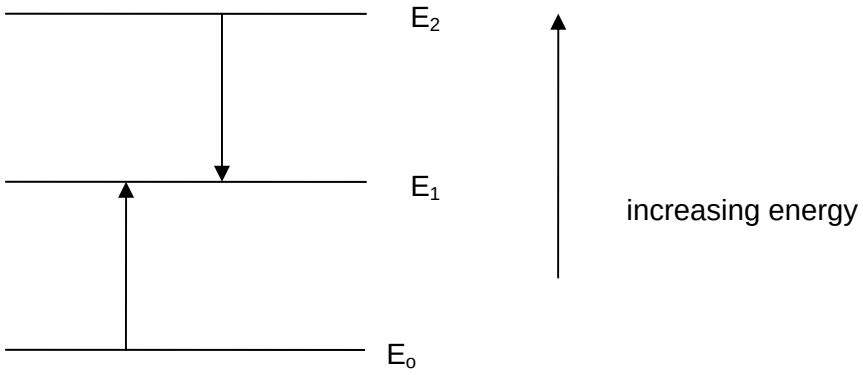


28 Two long straight wires X and Y are placed perpendicular to each other at a distance *d* apart. A current flows out of the page in wire X while a current flows from left to right in wire Y. What are the directions of the forces acting on wire Y at points P and Q due to the magnetic field produced by wire X?



	force at P	force at Q
A	out of page	into page
B	into page	out of page
C	towards X	away from X
D	towards X	towards X

29 The diagram shows part of the energy levels of an atom. The energy difference between E_o and E_1 is the same as that between E_1 and E_2.



If the transition from E_2 to E_1 corresponds to a red line in the element's spectrum, then the transition from E_o to E_1 corresponds to the

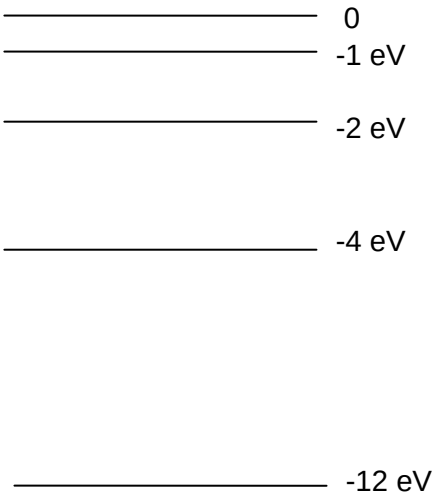
A absorption of red light.

B emission of red light.

C absorption of infra-red radiation.

D emission of infra-red radiation.

30 The energy level diagram for an atom is as shown below.



Which one of the following statements is correct?

A The most stable state of the atom is the level with zero energy.

B An electron can transit from the -1 eV level to 0 eV level by emitting an electron of energy 1 eV.

C An incident photon of energy 9 eV can impart part of its energy during collision with the atom and excite the electron in the atom from ground state to the -4eV level. The electron will be deflected with a smaller energy of 1 eV.

D An incident electron of energy 9 eV can impart part of its energy during collision with the atom and excite the electron in the atom from ground state to the -4eV level. The electron will be deflected with a smaller energy of 1 eV.