ASSESSMENT – 1

NAME: _____ **SUBJECT:** PHYSICS

CLASS: _____ **SECTION:** _____

MARKS: 30 **TIME:** 1 hr

Attempt all questions (30). Make sure assessment consists of **11** pages.

1 The physical quantities mass, weight and density are all related to one another.

Which quantities are scalars?

A mass, weight and density

B mass and density only

C mass only

D weight only

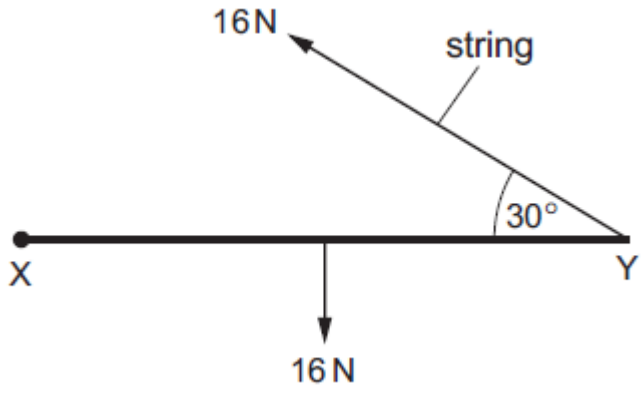
2 On a stationary ship a golf ball is struck so that it flies off horizontally from the edge of the deck of the ship at a speed of 72 m s^{-1}.

The deck is 46 m vertically above the sea. Ignore air resistance.

What is the horizontal distance the ball travels before landing in the sea?

A 74 m **B** 160 m **C** 220 m **D** 680 m

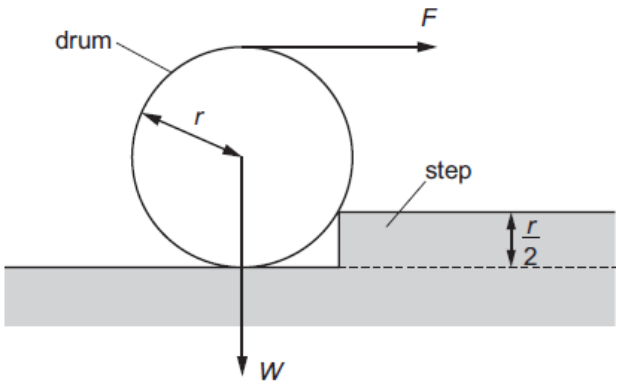
3 A rod XY of weight 16 N is hinged at X and supported by a string at Y. The string is at an angle of 30°. The tension in the string is 16 N.



What is the horizontal component of the force acting at X?

A 8.0 N **B** 9.0 N **C** 14 N **D** 16 N

4 A cylindrical drum has radius r and weight W. The drum is to be rolled over onto a step of height $\frac{r}{2}$ by a horizontal force F applied to the top of the drum.



What is the minimum force F required for the drum to start rolling on the step?

5 When a stationary nucleus undergoes alpha decay the resulting nucleus recoils in the opposite direction to the emitted alpha particle. The alpha particle is emitted with momentum p and kinetic energy E.

The mass of the recoiling nucleus is 50 times greater than the mass of the alpha particle.

What are the magnitudes of the momentum and kinetic energy of the recoiling nucleus?

	momentum	kinetic energy
A	p	E
B	p	$\frac{E}{50}$
C	$\frac{p}{50}$	E
D	$\frac{p}{50}$	$\frac{E}{50}$

6 On a journey from Alphatown to Betaville, a train accelerates uniformly from rest to 30.0 m s^{-1} in one minute. It then continues at constant speed for three minutes before decelerating uniformly to rest again in two minutes.

What distance does the train travel from Alphatown to Betaville?

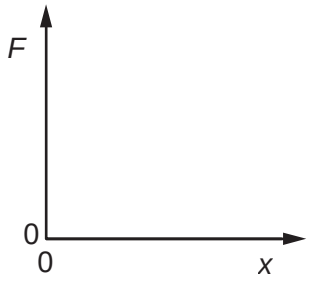
A 135 m **B** 180 m **C** 8.10 km **D** 10.8 km

7 A mass *m* is situated in a uniform gravitational field of strength *g*.

Which row describes the force on the mass due to the gravitational field?

	magnitude of force	direction of force
A	*g*	in direction of field
B	*g*	in opposite direction to field
C	*mg*	in direction of field
D	*mg*	in opposite direction to field

8 The graph shows how the extension *x* of a wire fixed at its upper end varies with the force *F* applied at the lower end.



The wire is of unstretched length *L*, cross-sectional area *A*, and made of material of Young modulus *E*.

Which expression is equal to the gradient of the graph?

A $\frac{EA}{L}$ **B** $\frac{EL}{A}$ **C** $\frac{A}{EL}$ **D** $\frac{L}{EA}$

9 A scale model of a table is made so that all its linear dimensions are one tenth of those of the real Table (scale 1 : 10). The model is made from the same wood as the table.

What is the value of stress in the legs of the model ÷ stress in the legs of the real table?

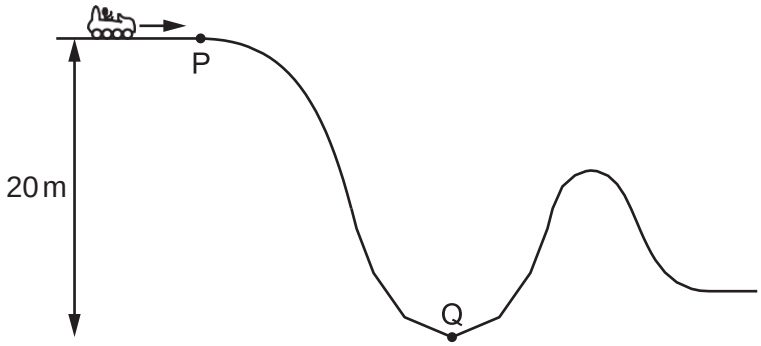
A 0.001 **B** 0.01 **C** 0.1 **D** 1

10 An electric motor is 40% efficient. When operating at full power, it has a useful power output of 2.0 kW.

How much electrical energy is transferred at full power in one minute?

A 0.80 kJ **B** 5.0 kJ **C** 48 kJ **D** 300 kJ

11 On the rollercoaster section shown, a car and passenger of total mass 400 kg travels at a speed of 10 $m\,s^{-1}$ as it passes through point P.

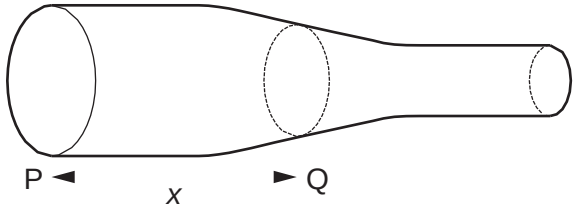


At which speed will the car and passengers pass through point Q?

Assume that frictional forces are negligible.

A 20 $m\,s^{-1}$ **B** 22 $m\,s^{-1}$ **C** 24 $m\,s^{-1}$ **D** 30 $m\,s^{-}$

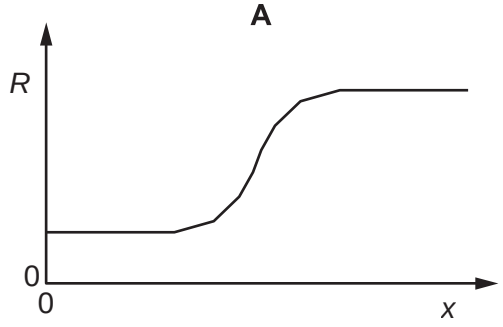
12 A metal wire is moulded so that its circular cross-section decreases.



The resistance *R* of the wire is measured between end P and Q, a distance *x* from P.

Which graph shows the variation of *R* with *x* as Q is moved from end P to the other end of the wire?

A



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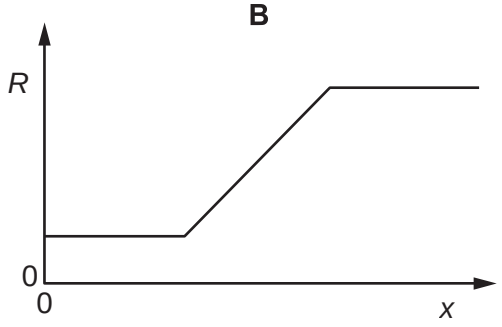

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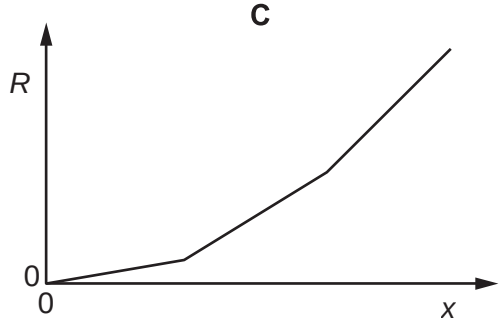

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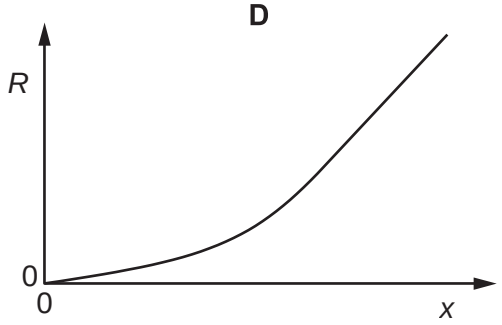
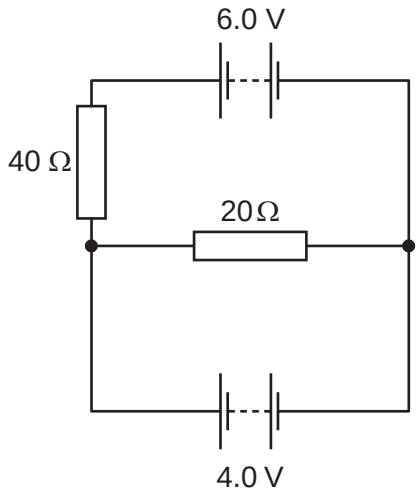


13 The diagram shows two batteries of electromotive force (emf) 6.0 V and 4.0 V connected in a circuit.



The internal resistance of each battery is negligible.

What is the current in the battery of emf 4.0 V?

A 0.05 A **B** 0.15 A **C** 0.20 A **D** 0.25 A

14 A standing wave is set up on a string. Two points P and Q on the string are located, as shown.

Which row correctly describes the phase difference and maximum speed of the vibrations of the two points?

	phase difference	maximum speed
A	π rad	different
B	zero	different
C	π rad	same
D	zero	same

15 A cell of electromotive force E and internal resistance r is connected in series with a resistor of resistance R. The potential difference across the terminals of the cell is V.

Which statement is **not** correct?

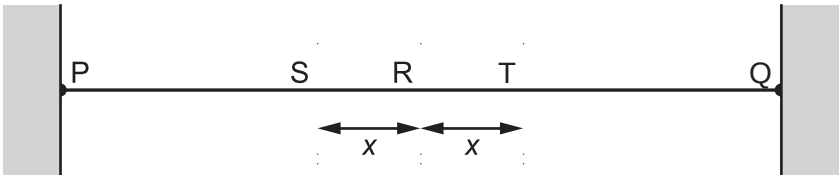
A power dissipated in cell = $r\left(\frac{E}{R+r}\right)^2$

B power dissipated in $r = \frac{V^2}{r}$

C power dissipated in $R = \frac{V^2}{R}$

D power dissipated in whole circuit = $\frac{E^2}{R+r}$

16 The diagram shows a string with its ends P and Q fixed.



The string is made to vibrate transversely so that P, Q and R are the only points of the string which are nodes.

S and T are two points equal distances x from R.

Which statement about the vibrations of the two points S and T, shown on the string, is correct?

A They have different amplitudes and are in phase.

B They have different amplitudes and differ in phase by 180°.

C They have the same amplitude and are in phase.

D They have the same amplitude and differ in phase by 180°.

17 The α-particle scattering experiments conducted in the early 1900s were important in determining the nuclear model of the atom.

Which conclusion was deduced from the scattering experiments?

A The α-particles were scattered by the atomic electrons.

B The majority of the volume of the atom was empty space.

C The nucleus of the atom attracted the α-particle.

D The nucleus of the atom contained protons.

18 Which is an S*I* base unit?

A current

B gram

C kelvin

D volt

19 Which pair contains one vector and one scalar quantity?

A	displacement	acceleration
B	force	kinetic energy
C	momentum	velocity
D	power	speed

20 When a constant braking force is applied to a vehicle moving at speed v, the distance d moved by the vehicle in coming to rest is given by the expression

$$d = kv^2$$

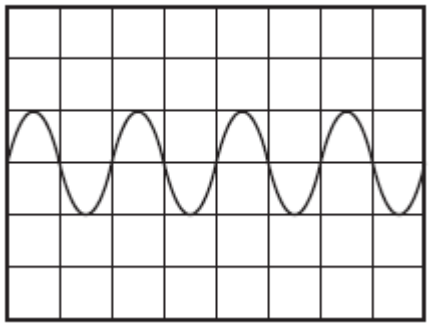
where k is a constant.

When d is measured in metres and v is measured in metres per second, the constant has a value of k_1.

What is the value of the constant when the distance is measured in metres, and the speed is measured in kilometres per hour?

A $0.0772\,k_1$ **B** $0.278\,k_1$ **C** $3.60\,k_1$ **D** $13.0\,k_1$

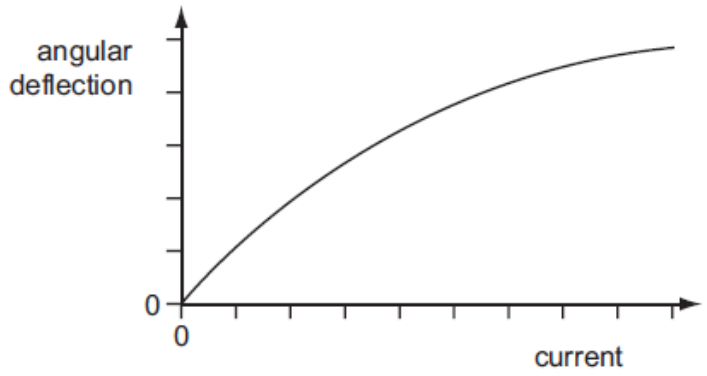
21 A whale produces sound waves of frequency 5 Hz. The waves are detected by a microphone and displayed on an oscilloscope.



What is the time-base setting on the oscilloscope?

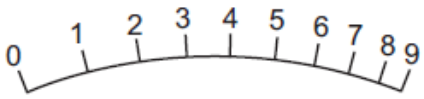
A $0.1\,\text{ms div}^{-1}$ B $1\,\text{ms div}^{-1}$ C $10\,\text{ms div}^{-1}$ D $100\,\text{ms div}^{-1}$

22 The angular deflection of the needle of an ammeter varies with the current in the ammeter as shown in the graph.

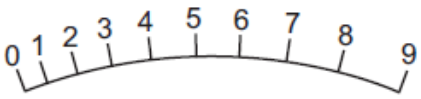


Which diagram could represent the appearance of the scale on this meter?

A



B



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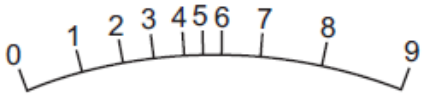


D

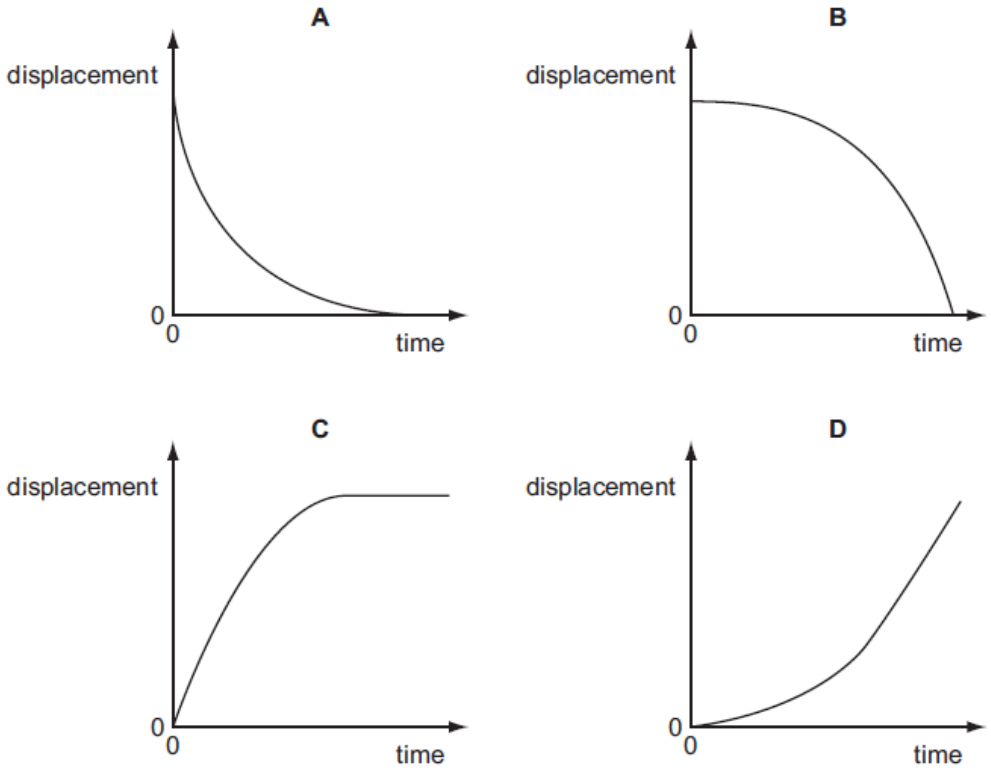
23 The strain energy W of a spring is determined from its spring constant k and extension x. The spring obeys Hooke's law and the value of W is calculated using the equation shown.

$$W = \tfrac{1}{2}kx^2$$

The spring constant is $100 \pm 2\,\text{N m}^{-1}$ and the extension is $0.050 \pm 0.002\,\text{m}$. What is the percentage uncertainty in the calculated value of W?

A 6% B 10% C 16% D 32%

24 A sphere is released and falls. Its initial acceleration reduces until it eventually begins to travel at constant terminal velocity. Which displacement-time graph best represents the motion of the sphere?



25 An insect jumps with an initial vertical velocity of 1.0 m s^{-1}, reaching a maximum height of 3.5×10^{-2} m. Assume the deceleration is uniform.

What is the magnitude of the deceleration?

A $3.6\,m\,s^{-2}$ B $9.8\,m\,s^{-2}$ C $14\,m\,s^{-2}$ D $29\,m\,s^{-2}$

26 A body having uniform acceleration *a* increases its velocity from *u* to *v* in time *t*.

Which expression would not give a correct value for the body's displacement during time *t*?

A $ut + \frac{1}{2}at^2$

B $vt - \frac{1}{2}at^2$

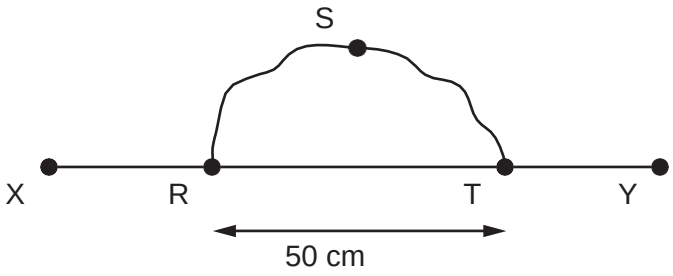
C $\frac{(v+u)(v-u)}{2a}$

D $\frac{(v-u)t}{2}$

27 What is a reasonable estimate of the average gravitational force acting on a fully grown woman standing on the Earth?

A 60 N B 250 N C 350 N D 650 N

28 A wire RST is connected to another wire XY as shown.



Each wire is 100 cm long with a resistance per unit length of 10 Ω m^{-1}.

What is the total resistance between X and Y?

A 3.3Ω B 5.0Ω C 8.3Ω D 13.3Ω

29 When α-particles are directed at gold leaf

1 almost all α-particles pass through without deflection,

2 a few α-particles are deviated through large angles.

What are the reasons for these effects?

	1	2
A	most α-particles have enough energy to pass right through the gold leaf	gold is very dense so a few low energy α-particles bounce back from the gold surface
B	most α-particles miss all gold atoms	a few α-particles bounce off gold atoms
C	the gold nucleus is very small so most α-particles miss all nuclei	occasionally the path of an α-particle is close to a nucleus
D	the positive charge in an atom is not concentrated enough to deflect an α-particle	occasionally an α-particle experiences many small deflections in the same direction

30 The nuclide $\mathbf{Rn}^{222}_{86}$ decays in a sequence of stages to form the nuclide $\mathbf{Pb}^{206}_{82}$.

Four of the nuclides formed in the sequence are α-particle emitters. The others are ß-particle emitters.

How many nuclides formed in the decay sequence are ß-particle emitters?

A 2 B 4 C 8 D 12