The Young Modulus
TOPIC QUESTIONS

| Level	A Level
Subject	Physics
Exam Board	AQA
Paper Type	Multiple Choice

Time Allowed : 30min

1. Which line, **A** to **D**, in the table correctly describes the trajectory of charged particles which enterseparately, at right angles, a uniform electric field, and a uniform magnetic field?

	uniform electric field	uniform magnetic field
A	parabolic	circular
B	circular	parabolic
C	circular	circular
D	parabolic	parabolic

2. The graph shows how the force acting on a body changes with time.
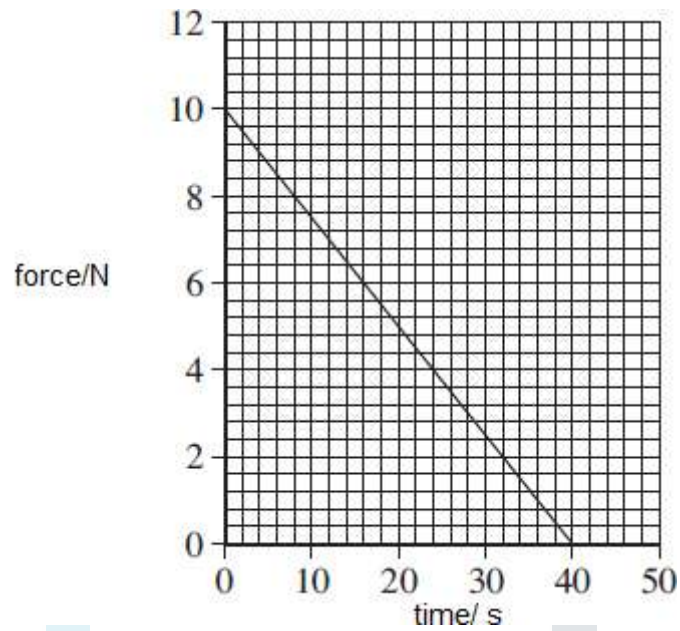
force/N

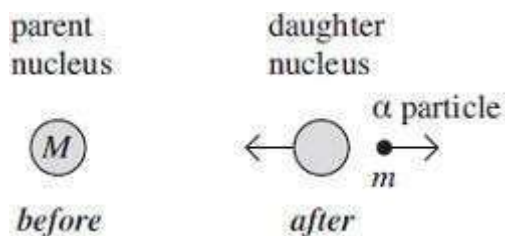The body has a mass of 0.25 kg and is initially at rest. What is the speed of the body after 40 sassuming no other forces are acting?

    A   200 ms^{-1}

    B   400 ms^{-1}

    C   800 ms^{-1}

    D   1600 ms^{-1}

3. A stationary unstable nucleus of mass M emits an α particle of mass m with kinetic energy E.

parent
nucleus

daughter
nucleus

α particle

M

m

before

after

What is the speed of recoil of the daughter nucleus?

A $\dfrac{\sqrt{2mE}}{(M-m)}$

B $\dfrac{\sqrt{2mE}}{M}$

C $\dfrac{(M-m)}{\sqrt{2mE}}$

D $\dfrac{2mE}{(M-m)^2}$

EXAM PAPERS PRACTICE

4. Two ice skaters, initially at rest and in contact, push apart from each other.
   Which line, **A** to **D**, in the table states correctly the change in the total momentum and the total kinetic energy of the two skaters?

	total momentum	total kinetic energy
A	unchanged	increases
B	unchanged	unchanged
C	increases	increases
D	increases	unchanged

5. A ball of mass 2.0 kg, initially at rest, is acted on by a force F which varies with time t asshown by the graph.
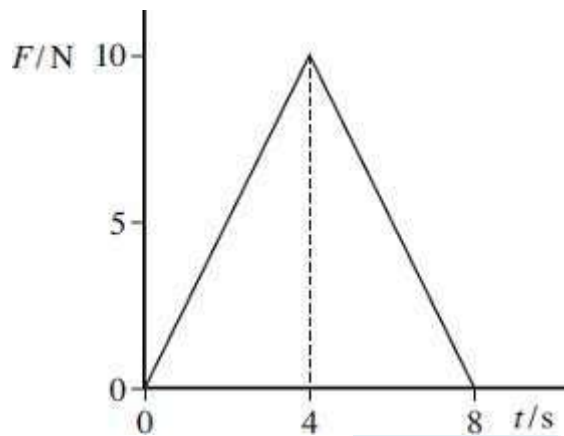
What is the velocity of the ball after 8.0 s?

A   20 ms^{-1}

B   40 ms^{-1}

C   80 ms^{-1}

D   160 ms^{-1}

6. A ballbearing X of mass $2m$ is projected vertically upwards with speed u. A ballbearing Y of mass m

is projected at 30° to the horizontal with speed $2u$ at the same time. Air resistance is negligible.Which of the following statements is correct?

A   The horizontal component of Y's velocity is u.

B   The maximum height reached by Y is half that reached by X

C   X and Y reach the ground at the same time.

D   X reaches the ground first.

7. What is the relationship between the distance y travelled by an object falling freely from rest and the time x the object has been falling?

A y is proportional to x^2

B y is proportional to $\sqrt{x}$

C y is proportional to $\dfrac{1}{x}$

D y is proportional to $\dfrac{1}{x^2}$

8. A car exerts a driving force of 500 N when travelling at a constant speed of 72 km h^{-1} on a level track. What is the work done in 5 minutes?
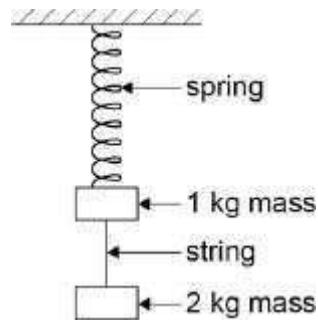
A 3.0×10^6 J

B 2.0×10^6 J

C 2.0×10^5 J

D 1.1×10^5 J

9. Two masses hang at rest from a spring, as shown in the diagram. The string separating the massesis burned through.

Which of the following gives the accelerations of the two masses as the string

breaks?acceleration of free fall = g

	acceleration of 1 kg mass upwards in $m\ s^{-2}$	acceleration of 2 kg mass downwards in $m\ s^{-2}$
A	$3\,g$	$1\,g$
B	$2\,g$	$2\,g$
C	$2\,g$	$1\,g$
D	$1\,g$	$1\,g$

10. An object falls freely from rest. After falling a distance d its velocity is v. What is its velocity after it has fallen a distance $2d$?

    A $2v$

    B $4v$

    C $2v^2$

    D $\sqrt{2}\,v$

11. The force on a sample of a material is gradually increased and then decreased. The graph of force against extension is shown in the diagram.
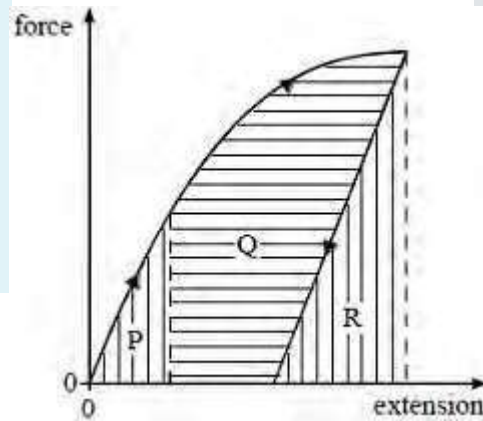
The increase in thermal energy in the sample is represented by area

    A   R

    B $P + Q$

    C $P + Q + R$

    D $P + Q - R$

12. The diagram shows a strobe photograph of a mark on a trolley **X**, moving from right to left, in collision with another trolley **Y** which had no mark

on it. After the collision both trolleys are in motion

together.

Which **one** of the following is consistent with the photograph?

A   Trolley **Y** has the same mass as trolley **X** and was initially stationary

B   Trolley **Y** had a smaller mass than **X** and was moving from right to left

C   Trolley **Y** had the same mass and was initially moving left to right at the same speed as trolley **X**

D   Trolley **Y** had the same mass and was initially moving left to right at a higher speed than trolley **X**

13. A perfectly elastic rubber ball falls vertically from rest and rebounds from the floor. Which one of the following velocity-time, v-t, graphs best represents the motion from the moment of release to the top of the first rebound?

A   B   C   D
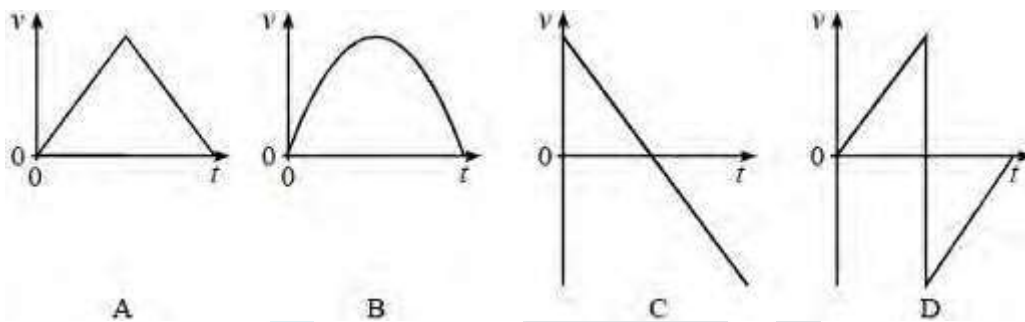
14. The diagram shows the graph of force on a car against time when the car of mass 500 kg crashes
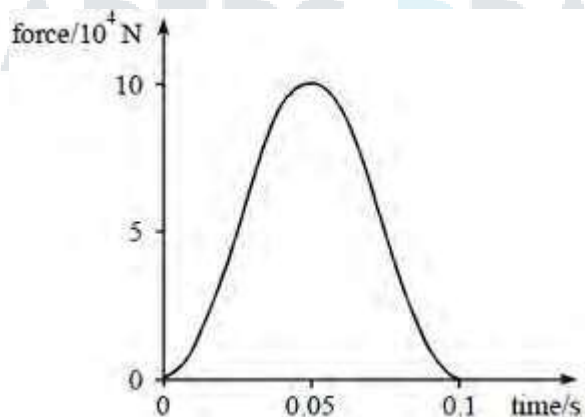
Which one of the following statements is correct?
A   The area under the graph is equal to the initial momentum of the car
B   Momentum is not conserved in the collision
C   Kinetic energy is conserved in the collision
D   The average force exerted on the car is 10×10^4 N

15. A stone is projected horizontally by a catapult consisting of two rubber cords. The cords, which obey Hooke's law, are stretched and released. When each cord is extended by x,

the stone is projected with a speed *v*. Assuming that all the strain energy in the rubber is transferred to thestone, what is the speed of the stone when each cord is extended by 2*x*?

A *v*

B $\sqrt{2v}$

C 2*v*

D 4*v*

16. The graph shows the variation with time, *t*, of the force, *F*, acting on a body.
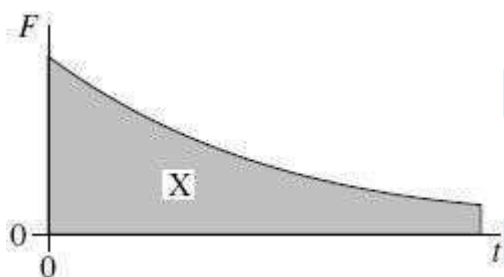
What physical quantity does the area X represent?

A the displacement of the body

B the acceleration of the body

C the change in momentum of the body

D the change in kinetic energy of the body

17. Water of density 1000 kg m^{-3} flows out of a garden hose of cross-sectional area 7.2 × 10^{-4} m^{2}at a rate of 2.0 × 10^{-4} m^3 per second. How much momentum is carried by the water leaving the hose per second?

A 5.6 × 10^{-5} N s

B 5.6 × 10^{-2} N s

C 0.20 N s

D 0.72 N s

18. Which row, **A** to **D**, in the table correctly shows the quantities conserved in an inelastic collision?

	mass	momentum	kinetic energy	total energy
A	conserved	not conserved	conserved	conserved
B	not conserved	conserved	conserved	not conserved
C	conserved	conserved	conserved	conserved
D	conserved	conserved	not conserved	conserved

19. A 10 mF capacitor is charged to 10 V and then discharged completely through a small motor. During this process, the motor lifts a weight of mass 0.10 kg. If 10% of the energy stored in thecapacitor is used to lift the weight, through what approximate height will the weight be lifted?

    A   0.05 m

    B   0.10 m

    C   0.50 m

    D   1.00m

20.
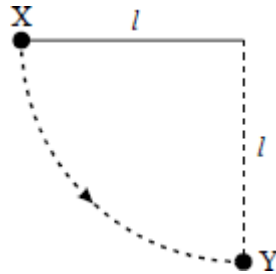
A ball of mass m, which is fixed to the end of a light string of length l, is released from rest at X. It swings in a circular path, passing through the lowest point Y at speed v. If the tension in the string at Y is T, which one of the following equations represents a correct application of Newton's laws of motion to the ball at Y?

A $T = \dfrac{mv^2}{l} - mg$

B $T - mg = \dfrac{mv^2}{l}$

C $mg - T = \dfrac{mv^2}{l}$

D $T + \dfrac{mv^2}{l} = mg$