

**GCSE Physics A (Gateway)**

**J249/03 Physics A P1-P4 and P9 (Higher Tier)**

**Question Set 26**

Multiple Choice Questions

P2: Forces

1

A car travels 200 km in four hours.

The car **doubles** its speed.

How long would it take for the car to travel 50 km?

$$200 \text{ km in 4 hrs} \\ = 50 \text{ km/h.}$$

A 0.5 hours

B 1.0 hours

C 2.0 hours

D 4.0 hours

$$100 \text{ km/h} \\ \therefore 50 \text{ km} \\ = \frac{1}{2} \text{ h.}$$

Your answer

A

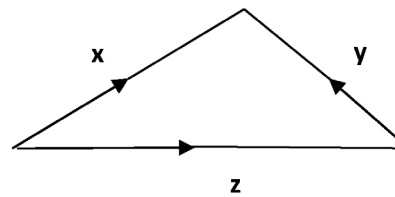
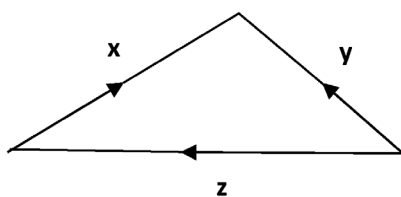
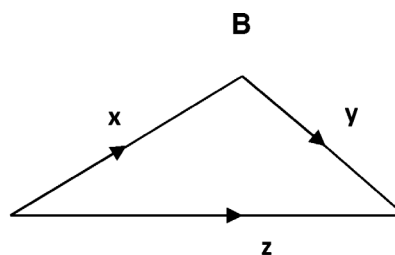
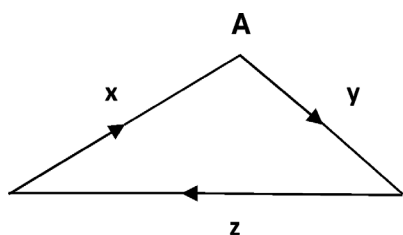
[1]

2

Three forces, **x**, **y** and **z** act on a body.

The body is in **equilibrium**.

Which vector diagram shows the body in equilibrium?



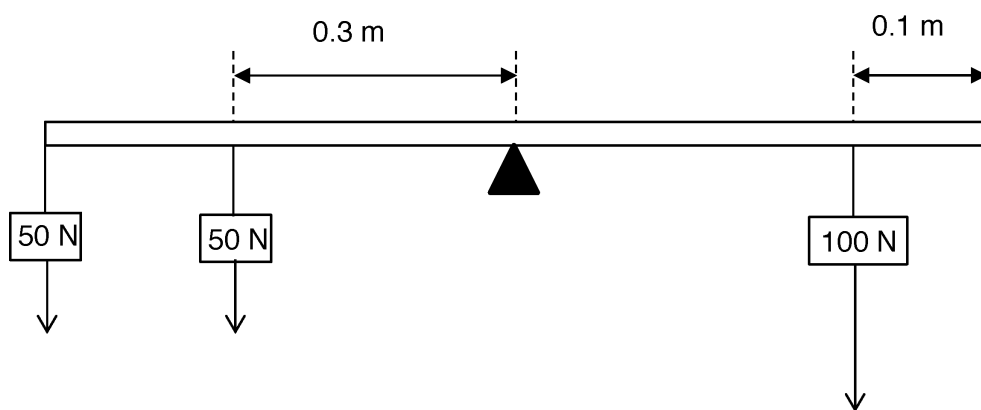
Your answer

A

[1]

3

A uniform 1.0 m rod is pivoted at its centre.



The rod is in equilibrium.

What is the anti-clockwise moment about the pivot?

- A 10 N m
- B 15 N m
- C 40 N m
- D 100 N m

$$\begin{aligned} & (50 \times 0.3) + (50 \times 0.5) \\ & = 15 + 25 \\ & = 40 \end{aligned}$$

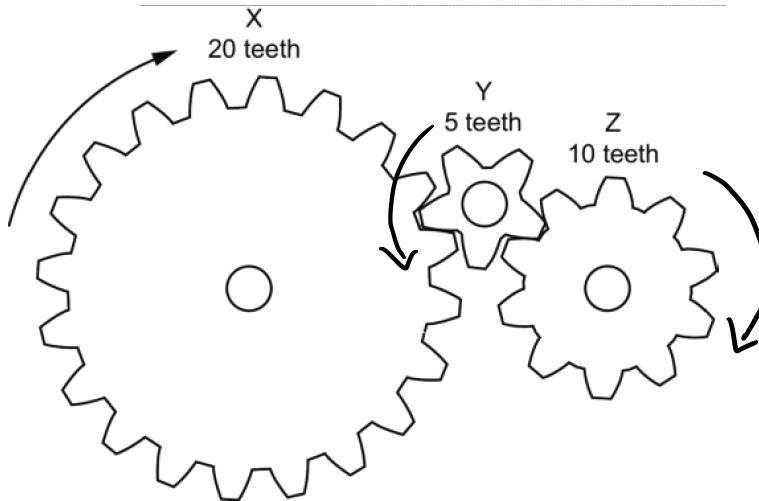
Your answer

C

[1]

4

The diagram shows 3 gears.



Gear X is rotated clockwise at 1.0 rotations per second.

Which row describes the movement of gear Z?

	Direction of rotation	Rotations per second
A	anticlockwise	0.5
B	anticlockwise	2.0
C	clockwise	0.5
D	clockwise	2.0

20 teeth = 1 rotation/second.  
 10 teeth = 2 rotations/second

Your answer

D

[1]

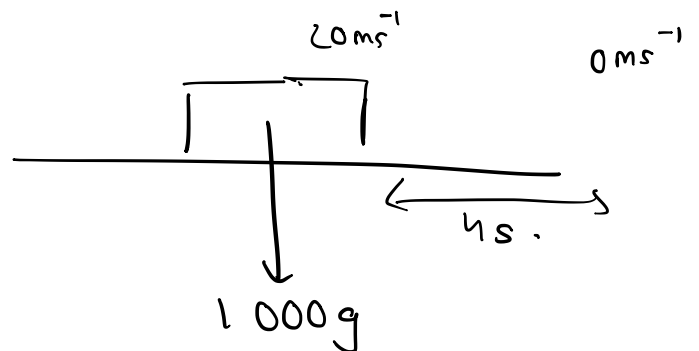
5

A car and driver with a total mass of 1 000 kg is travelling at 20 m/s.

The driver applies the brake and the car comes to a stop in 4 seconds.

What is the mean force on the car?

- A 12.5 N
- B 200 N
- C 5 000 N
- D 80 000 N



Your answer

C

[1]

$$F = 1000 \times -5$$

$$= -5000$$

$$v = u + at$$

$$0 = 20 + 4a$$

$$-4a = 20$$

$$a = -5$$

6

A spring, of spring constant 16 N/m, is stretched by 50 cm.

What is the work done?

- A 2.0 J
- B 8.0 J
- C 12.5 J
- D 25.0 J

$$E_e = \frac{1}{2} \times 16 \times 0.5^2$$
$$= 2$$

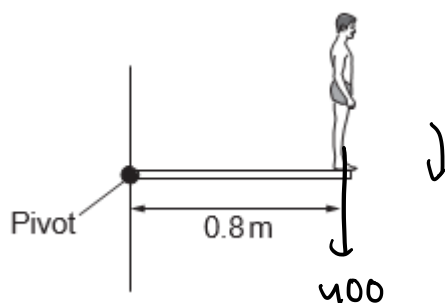
Your answer

A

[1]

7

A diver stands on a diving board. He weighs 400 N.



What is the moment of the force provided by the diver around the pivot?

- A 320 Nm anti-clockwise
- B 320 Nm clockwise
- C 500 Nm anti-clockwise
- D 500 Nm clockwise

$$400 \times 0.8 = 320.$$

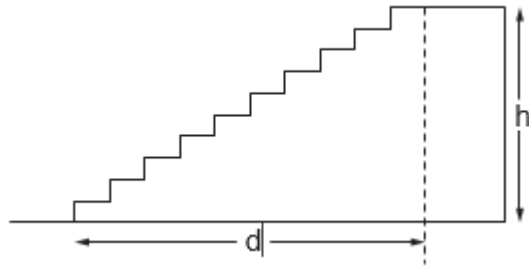
Your answer

B

[1]

8

A student of weight  $W$  runs up a flight of stairs..



She moves a distance  $d$  metres horizontally and  $h$  metres vertically.

What is the work done against gravity running up the stairs?

A  $W \times d$

B  $W \times h$

C  $(W \times d) + (W \times h)$

D  $W \times \frac{h}{d}$

$$\begin{aligned} \text{Work} &= F \times d \\ &= F \times h \end{aligned}$$

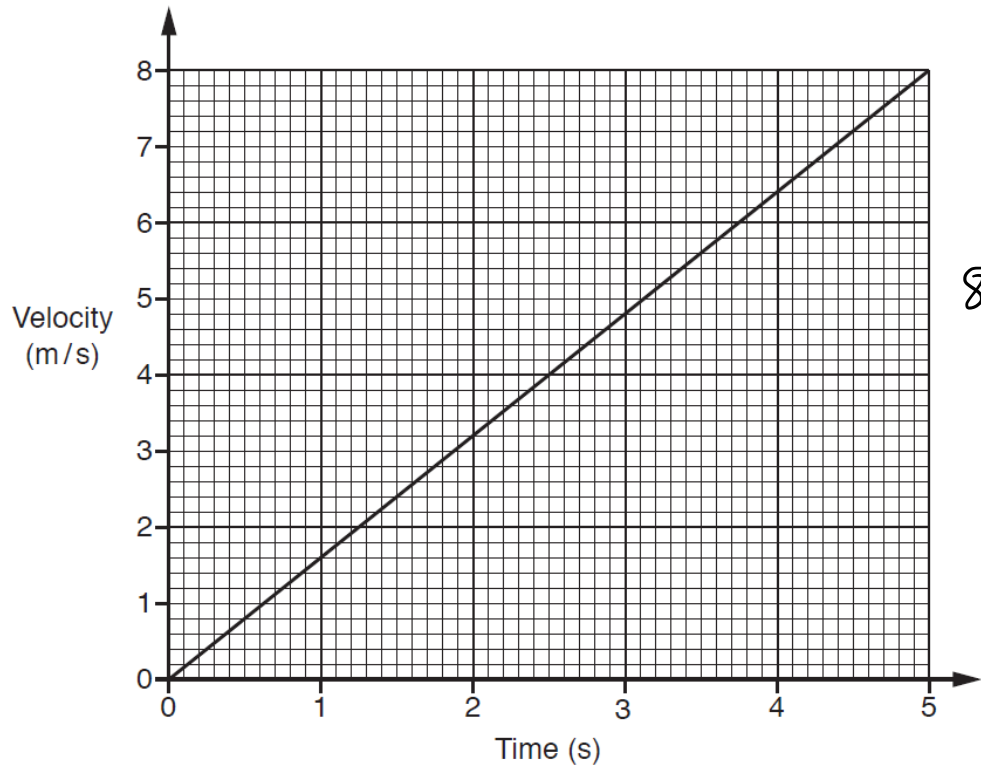
Your answer

**B**

[1]

9

Look at the velocity-time graph of an object.



What is the distance travelled by the object in 5s?

- A 0.63 m
- B 1.6 m
- C 20 m
- D 40 m

Your answer

C

$$\text{Speed} = \frac{\text{distance}}{\text{time}}$$

$$8 \times 5 = 40\text{m}$$

$$\frac{40}{2} = 20\text{m}$$

[1]

10

Which statement is equivalent to the mass of an object?

- A The ratio of acceleration over force
- B The ratio of force over acceleration
- C The ratio of velocity over acceleration
- D The ratio of displacement over acceleration

Your answer

B

$$F = ma$$

$$\frac{F}{a} = m$$

[1]

11

Two cars head towards each other on a road.



What velocity does the driver of car **Q** see car **P** travelling towards him at?

- A 10 m/s
- B 15 m/s
- C 25 m/s
- D 40 m/s

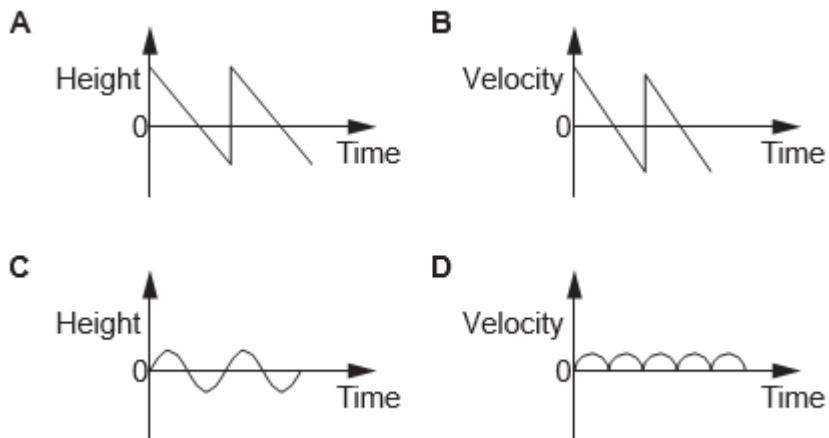
Your answer

D

[1]

12

Which graph shows a bouncing ball?



Your answer

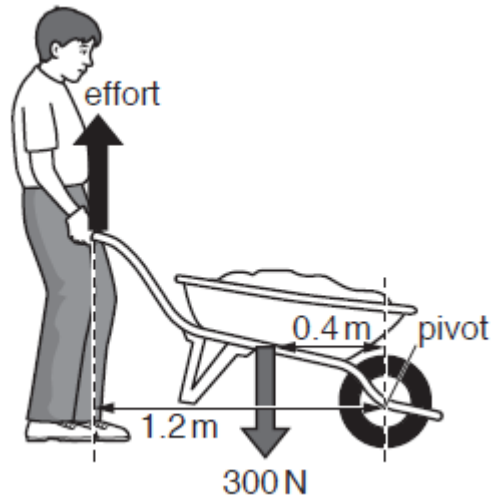
B

[1]



13

A man lifts a load using a wheelbarrow.



What is the effort needed to lift the load using the wheelbarrow?

- A 100 N
- B 120 N
- C 250 N
- D 144 N

$$300 \times 0.4 = 1.2 \text{ Effort}$$
$$100 = \text{Effort}$$

Your answer

A

[1]

14

A 2.0 kg object moves at a velocity of 40 m / s.

What is the momentum of the object?

Use the equation: momentum = mass  $\times$  velocity

- A 20 kg m / s
- B 38 kg m / s
- C 42 kg m / s
- D 80 kg m / s

$$2 \times 40 = 80$$

Your answer

D

[1]

15 Which one of the following uses of forces causes a rotation?

- A Lowering a book vertically from a shelf
- B Opening a door
- C Lifting a book vertically onto a shelf
- D Sitting in the centre of a see-saw

Your answer

B

[1]

16 On the Moon, a 10 kg mass has a weight of 16 N.

What is the gravitational field strength on the Moon?

- A 1.6 N/kg
- B 6.0 N/kg
- C 26 N/kg
- D 160 N/kg

$$16 = 10g$$
$$g = 1.6$$

Your answer

A

[1]

17 Which object has the **most** gravitational potential energy?

- A 1 kg bag on a shelf 1 m above the ground
- B 2 kg bag on a shelf 1 m above the ground
- C 2 kg bag on a shelf 2 m above the ground
- D 1 kg bag on a shelf 2 m above the ground

$$1 \times 1 \times g = g$$

$$2 \times g \times 1 = 2g$$

$$2 \times g \times 2 = 4g$$

$$1 \times g \times 2 = 2g$$

Your answer

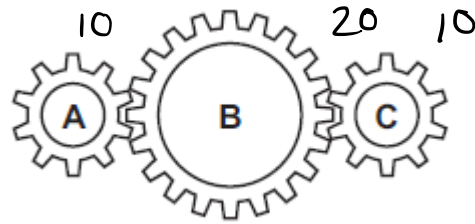
C

[1]

18

A student investigates cogs and gears.

Cogs **A** and **C** have 10 teeth. Cog **B** has 20 teeth.



Cog **A** is turned 5 times.

How many times does cog **C** turn?

- A 5 times
- B 10 times
- C 20 times
- D 50 times

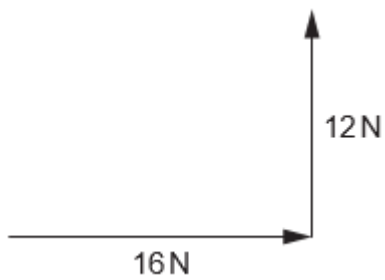
Your answer

A

[1]

19

Two forces act at right angles to each other.

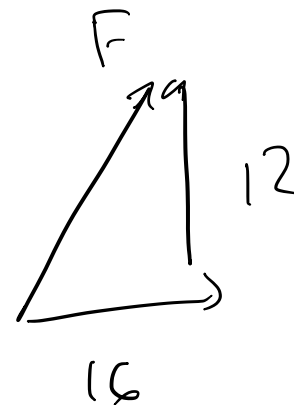


What is the magnitude of the resultant force?

- A 18 N
- B 20 N
- C 22 N
- D 24 N

Your answer

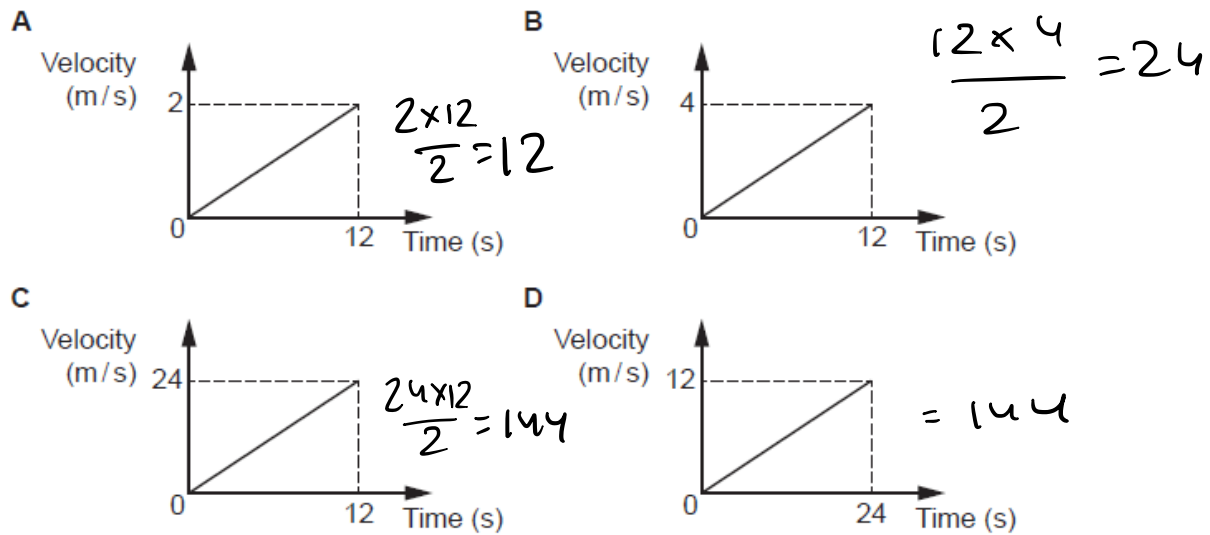
B



$$\sqrt{12^2 + 16^2} = 20 \quad [1]$$

20

Look at the motion graphs.



Which graph shows a journey with a distance of 24 m?

Your answer

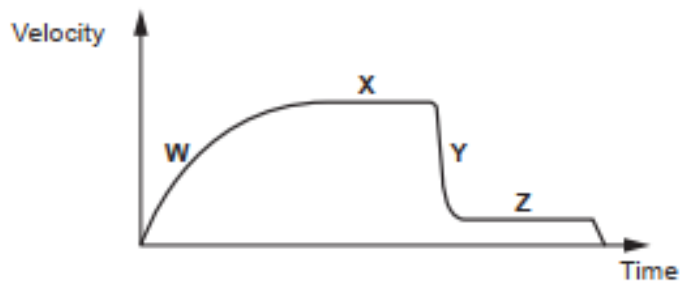
B

[1]

21

A skydiver falls from a plane. His parachute opens and he lands safely.

Look at the velocity-time graph of his journey.



Which parts of the graph show balanced forces on the skydiver?

- A X only
- B Y and Z
- C X and Z
- D Y only

Your answer

C

[1]

22

A spring stretches by 2.0 cm when a force is added.

The spring constant is 60 N/m.

Calculate the energy transferred to the spring when it is stretched.

A 0.012 J

B 0.024 J

C 120 J

D 240 J

$$\frac{1}{2} \times 60 \times 0.02^2$$
$$= 0.012 \text{ J}$$

Your answer

A

[1]

**Total Marks for Question Set 26: 22**

## Equations in physics

$$(\text{final velocity})^2 - (\text{initial velocity})^2 = 2 \times \text{acceleration} \times \text{distance}$$

$$\text{change in thermal energy} = \text{mass} \times \text{specific heat capacity} \times \text{change in temperature}$$

$$\text{thermal energy for a change in state} = \text{mass} \times \text{specific latent heat}$$

$$\text{energy transferred in stretching} = 0.5 \times \text{spring constant} \times (\text{extension})^2$$

$$\text{potential difference across primary coil} \times \text{current in primary coil} = \text{potential difference across secondary coil} \times \text{current in secondary coil}$$

### Higher tier only –

$$\text{force on a conductor (at right angles to a magnetic field) carrying a current} = \text{magnetic flux density} \times \text{current} \times \text{length}$$

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