

1)

1 Which expression has the same SI base units as pressure?

**A**  $\frac{\text{force}}{\text{length} \times \text{speed}}$

**B**  $\frac{\text{force}}{\text{length} \times \text{time}}$

**C**  $\frac{\text{mass}}{\text{length} \times (\text{time})^2}$

**D**  $\frac{\text{mass} \times (\text{time})^2}{\text{length}}$

2)

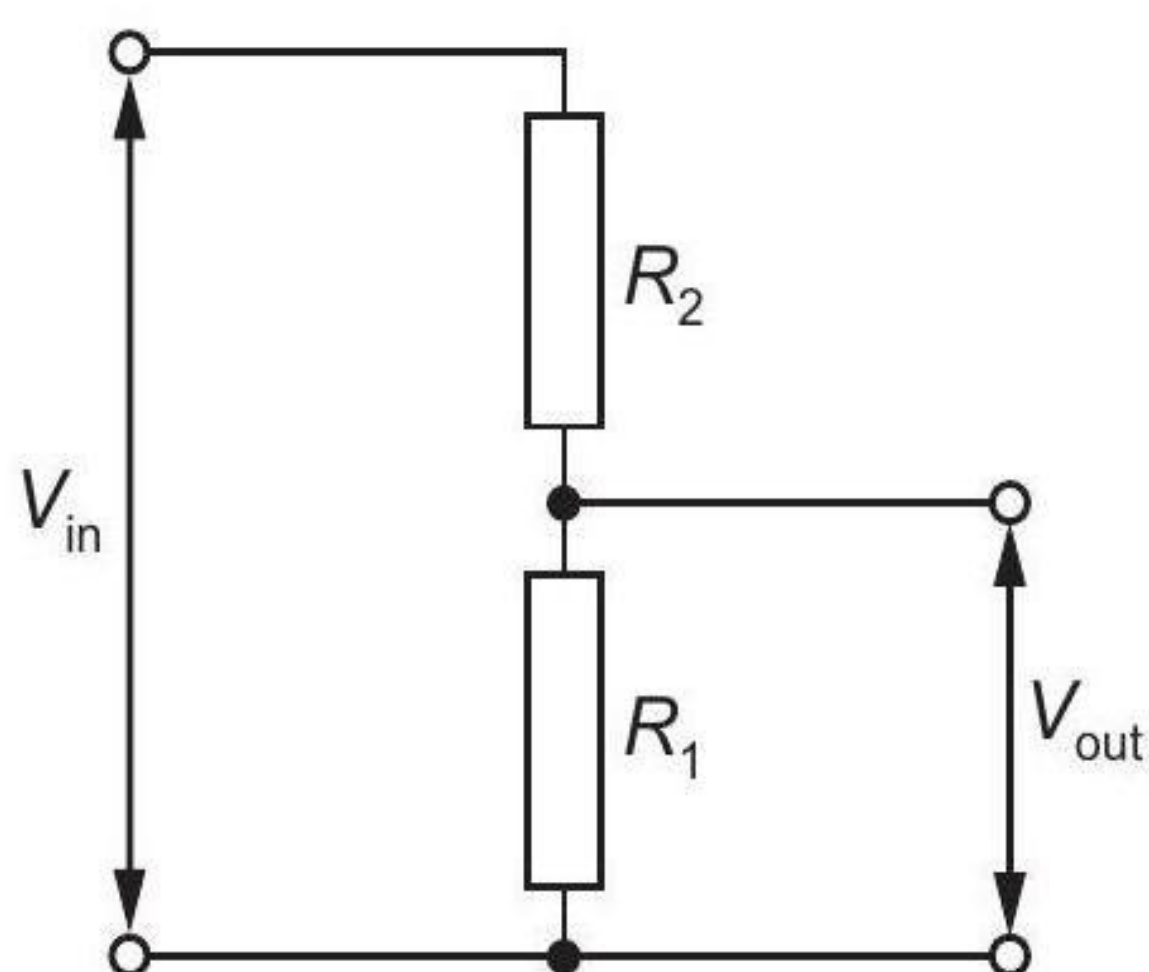
33 The potential difference across a resistor is 12 V. The current in the resistor is 2.0 A.

A charge of 4.0 C passes through the resistor.

What is the energy transferred in the resistor and the time taken for the charge to pass through the resistor?

	energy / J	time / s
<b>A</b>	3.0	2.0
<b>B</b>	3.0	8.0
<b>C</b>	48	2.0
<b>D</b>	48	8.0

- 3) 37 A potential divider consists of two resistors of resistances  $R_1$  and  $R_2$  connected in series across a source of potential difference (p.d.)  $V_{\text{in}}$ . The p.d. across  $R_1$  is  $V_{\text{out}}$ .



Which changes to  $R_1$  and to  $R_2$  will increase the value of  $V_{\text{out}}$ ?

	$R_1$	$R_2$
<b>A</b>	doubled	doubled
<b>B</b>	doubled	halved
<b>C</b>	halved	doubled
<b>D</b>	halved	halved

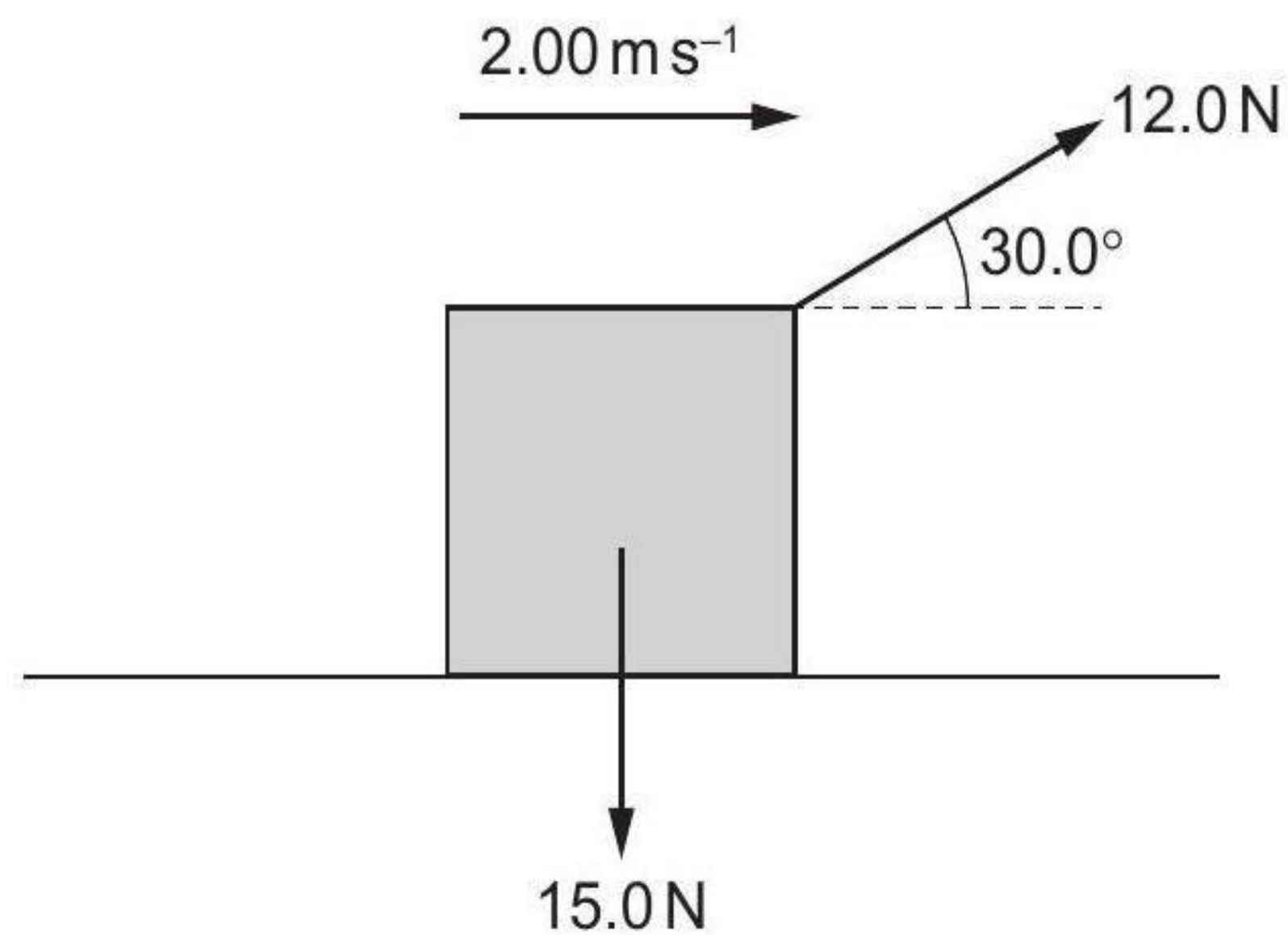
- 4) 32 An electron is in a uniform electric field of field strength  $1500 \text{ V m}^{-1}$ .

What is the acceleration of the electron due to the electric field?

- A**  $8.5 \times 10^{-9} \text{ m s}^{-2}$
- B**  $1.6 \times 10^{-5} \text{ m s}^{-2}$
- C**  $1.4 \times 10^{11} \text{ m s}^{-2}$
- D**  $2.6 \times 10^{14} \text{ m s}^{-2}$



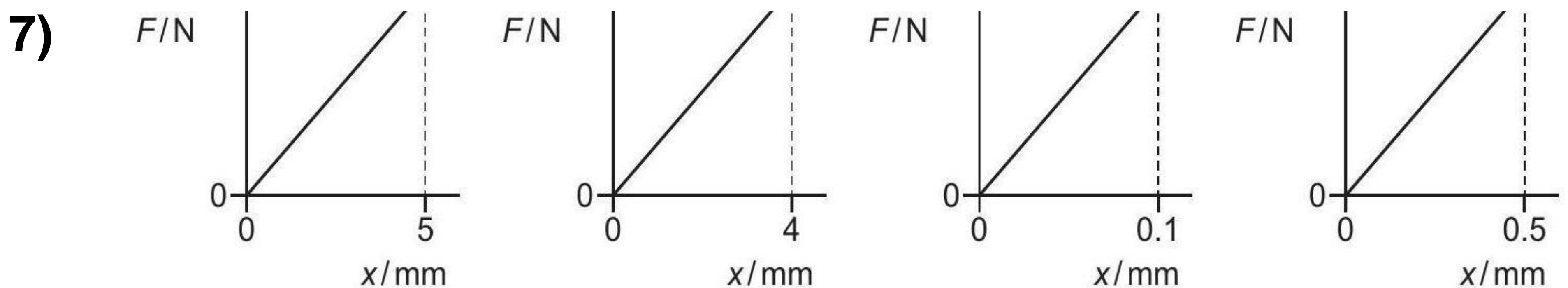
- 5) 18 An object of weight 15.0 N is pulled along a horizontal surface at a constant velocity of  $2.00 \text{ m s}^{-1}$ .  
The force pulling the object is 12.0 N at  $30.0^\circ$  to the horizontal, as shown.



What is the power used to move the object?

- A 12.0 W      B 20.8 W      C 24.0 W      D 30.0 W

- 6) 19 The spring constants of four springs are determined by plotting the following graphs of force  $F$  against extension  $x$ .



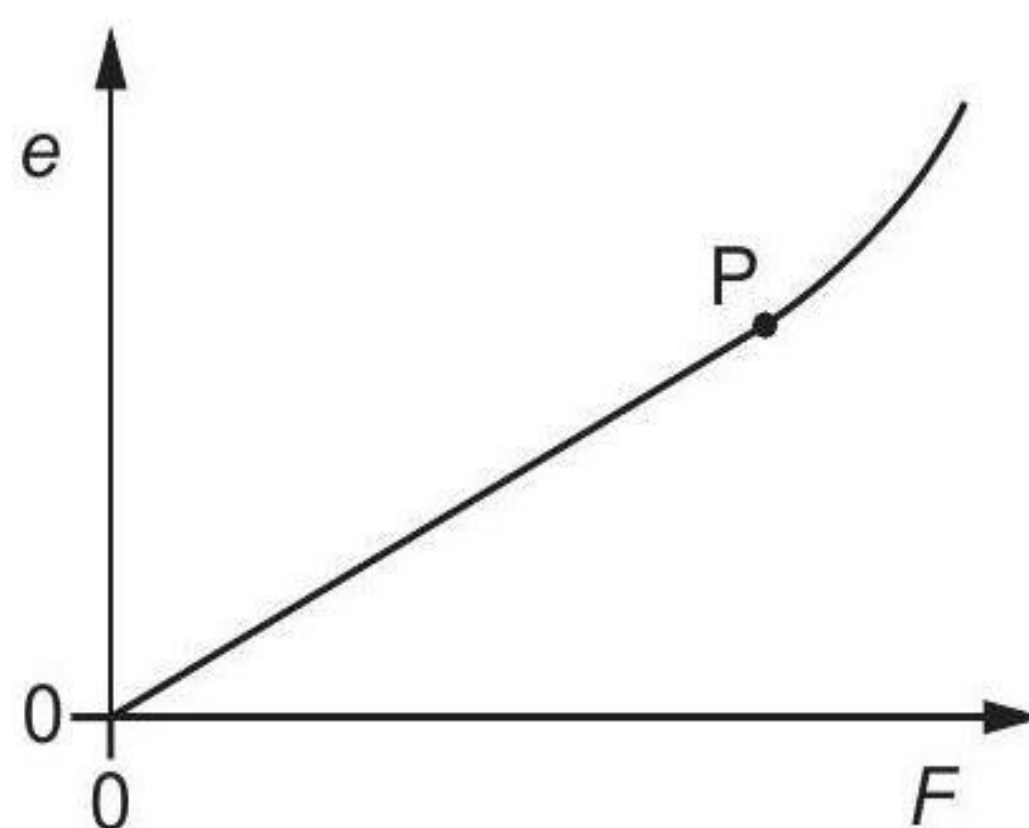
Which order of the graphs shows **decreasing** spring constants?

- A  $2 \rightarrow 1 \rightarrow 3 \rightarrow 4$   
B  $3 \rightarrow 4 \rightarrow 2 \rightarrow 1$   
C  $4 \rightarrow 2 \rightarrow 1 \rightarrow 3$   
D  $4 \rightarrow 3 \rightarrow 2 \rightarrow 1$



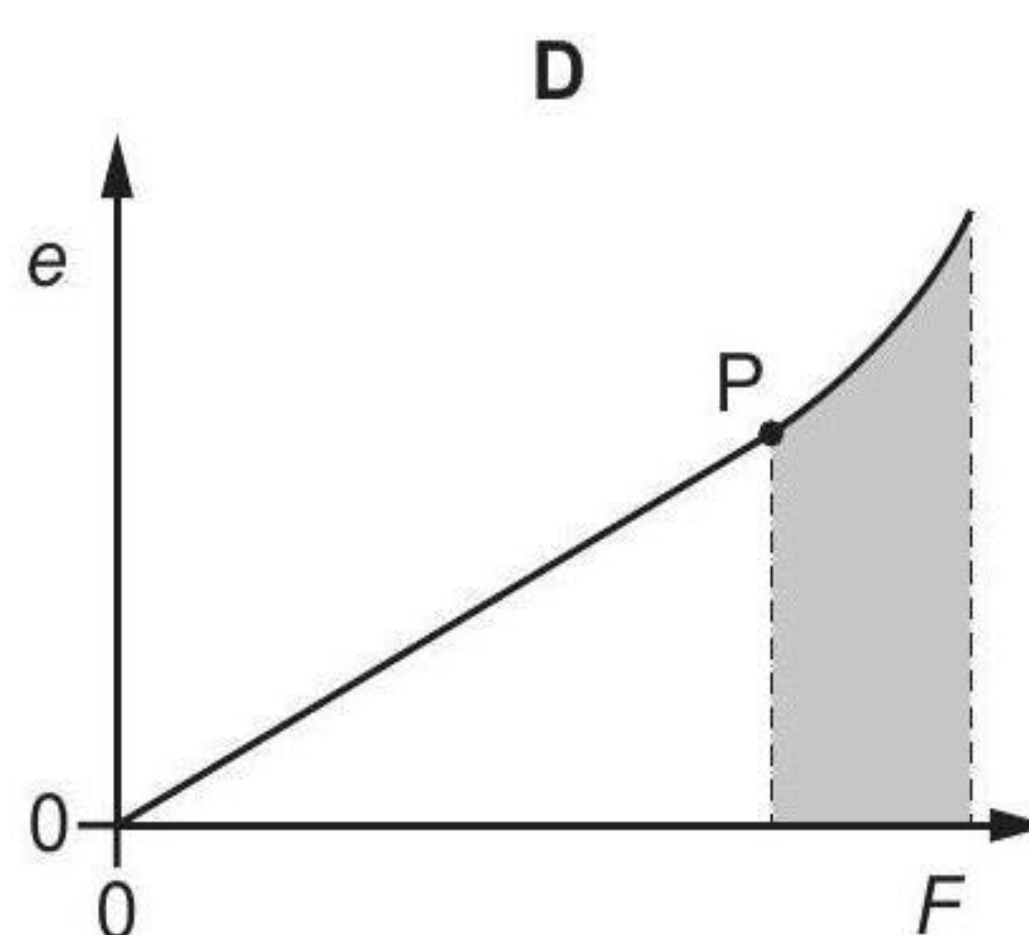
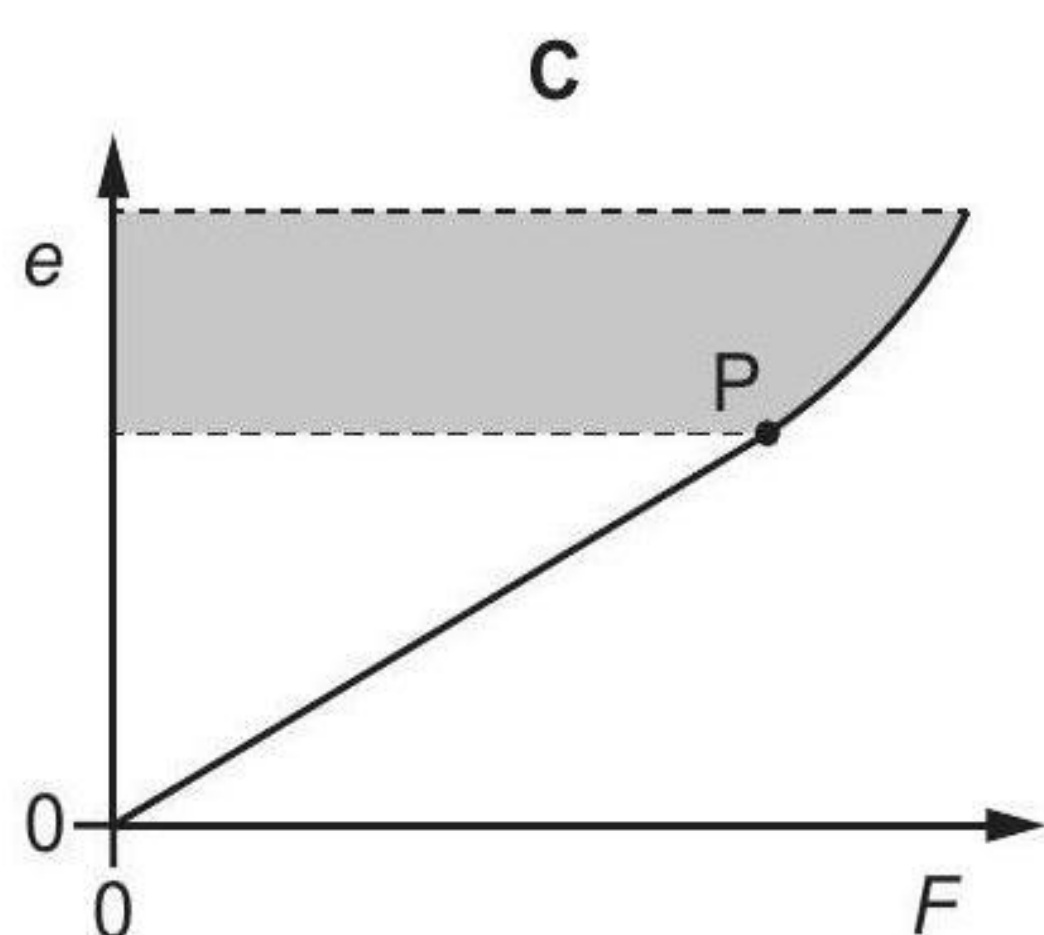
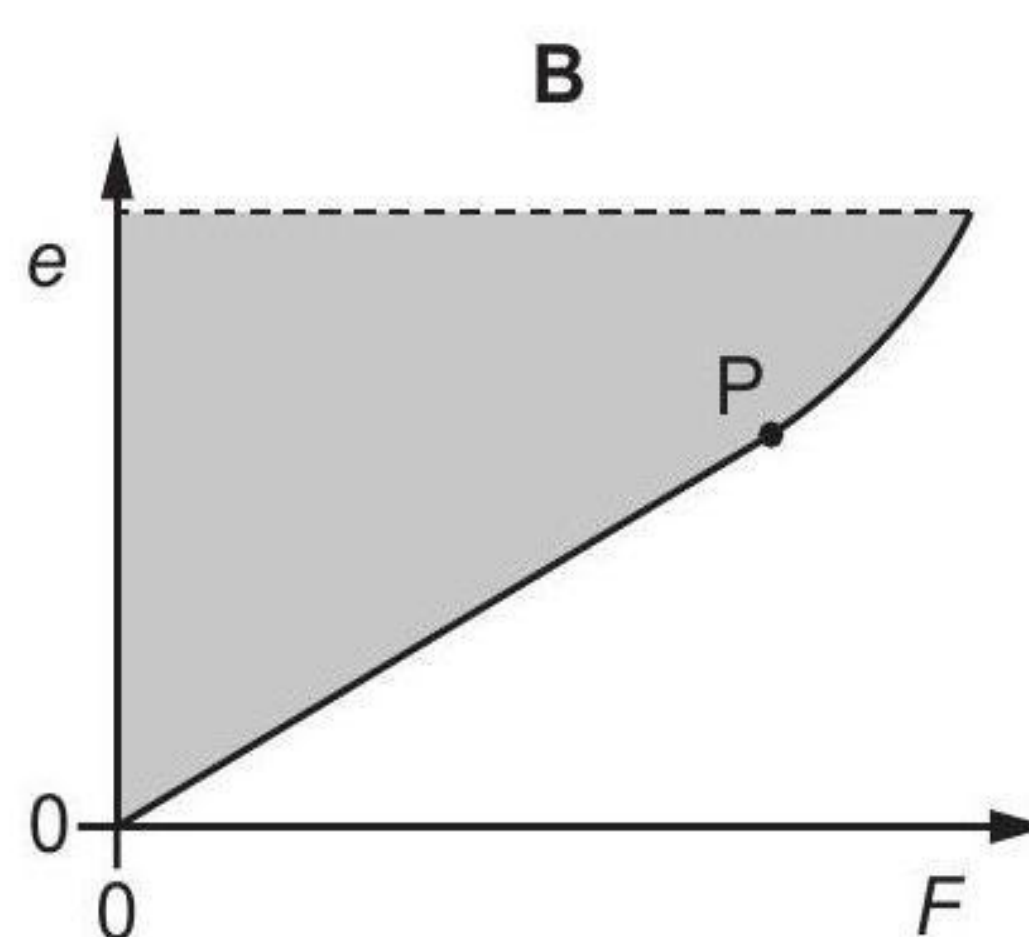
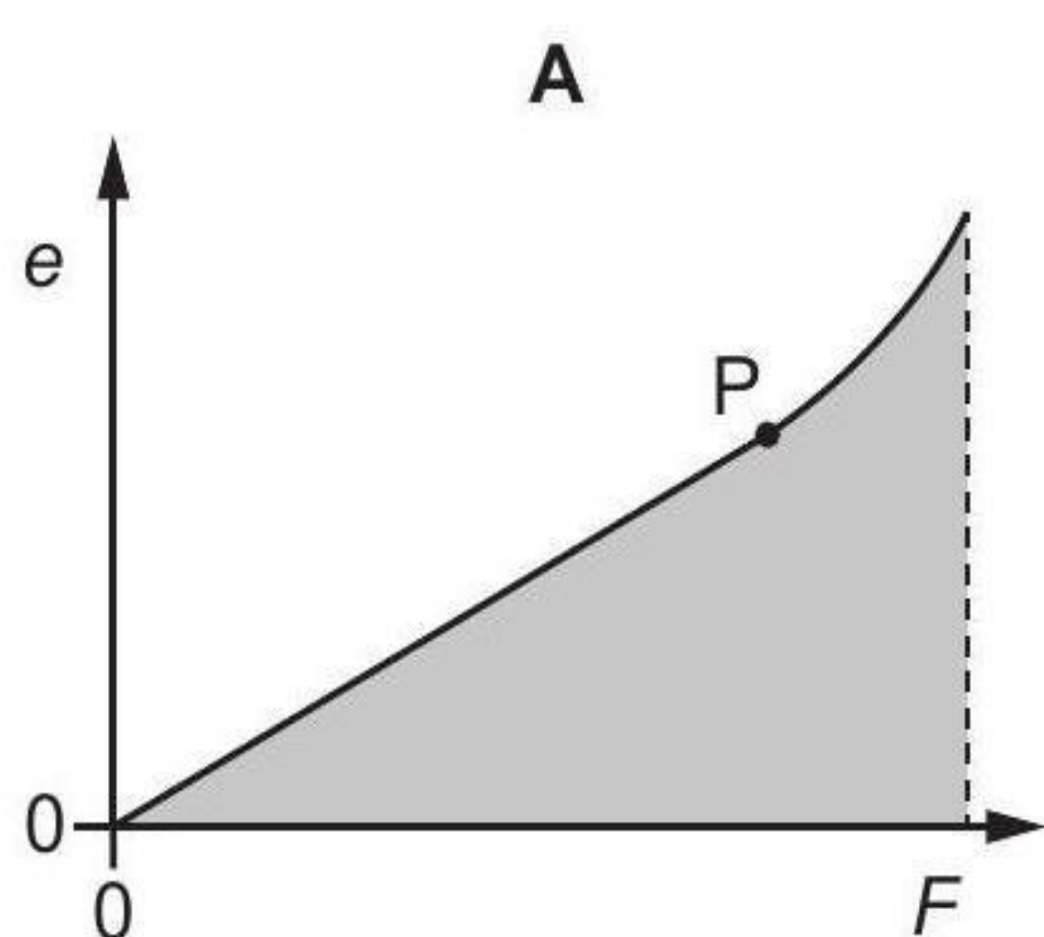
8)

- 20 Forces are applied to the ends of a rod so that its length increases. The variation with force  $F$  of the extension  $e$  of the rod is shown.



The point P is the elastic limit.

Which shaded area represents the work done during the plastic deformation of the rod?



9)

- 23 Which statement about waves is correct?

- A** Both longitudinal and transverse waves can travel through a vacuum.
- B** Both longitudinal and transverse waves transfer matter.
- C** Longitudinal progressive waves consist of alternate nodes and antinodes.
- D** The particles of a transverse wave vibrate perpendicular to the direction of energy propagation.

- 10)** **25** A train travels at constant speed along a straight track. The train's horn emits sound of frequency 500 Hz.

A person standing by the side of the track hears sound of frequency 450 Hz.

The speed of sound in air is  $340 \text{ m s}^{-1}$ .

What is the speed of the train and in which direction is it travelling relative to the person?

	speed / $\text{m s}^{-1}$	direction
<b>A</b>	34	away from the person
<b>B</b>	34	towards the person
<b>C</b>	38	away from the person
<b>D</b>	38	towards the person

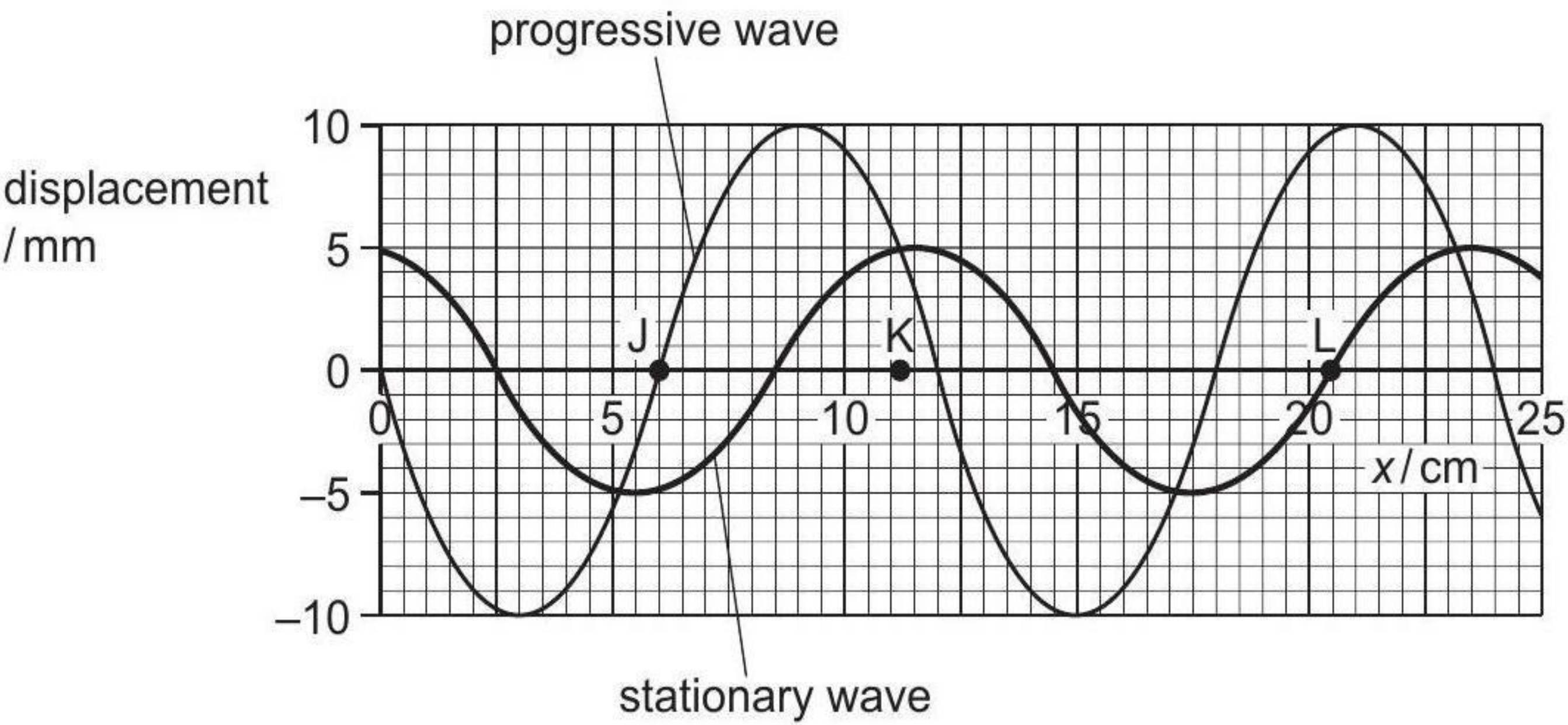
- 11)** **26** A smooth surface has bumps on the surface that are smaller than the wavelength of visible light.

What is the approximate maximum size of the largest bumps on the surface?

- A** 20 nm      **B** 350 nm      **C** 720 nm      **D**  $5.0 \mu\text{m}$



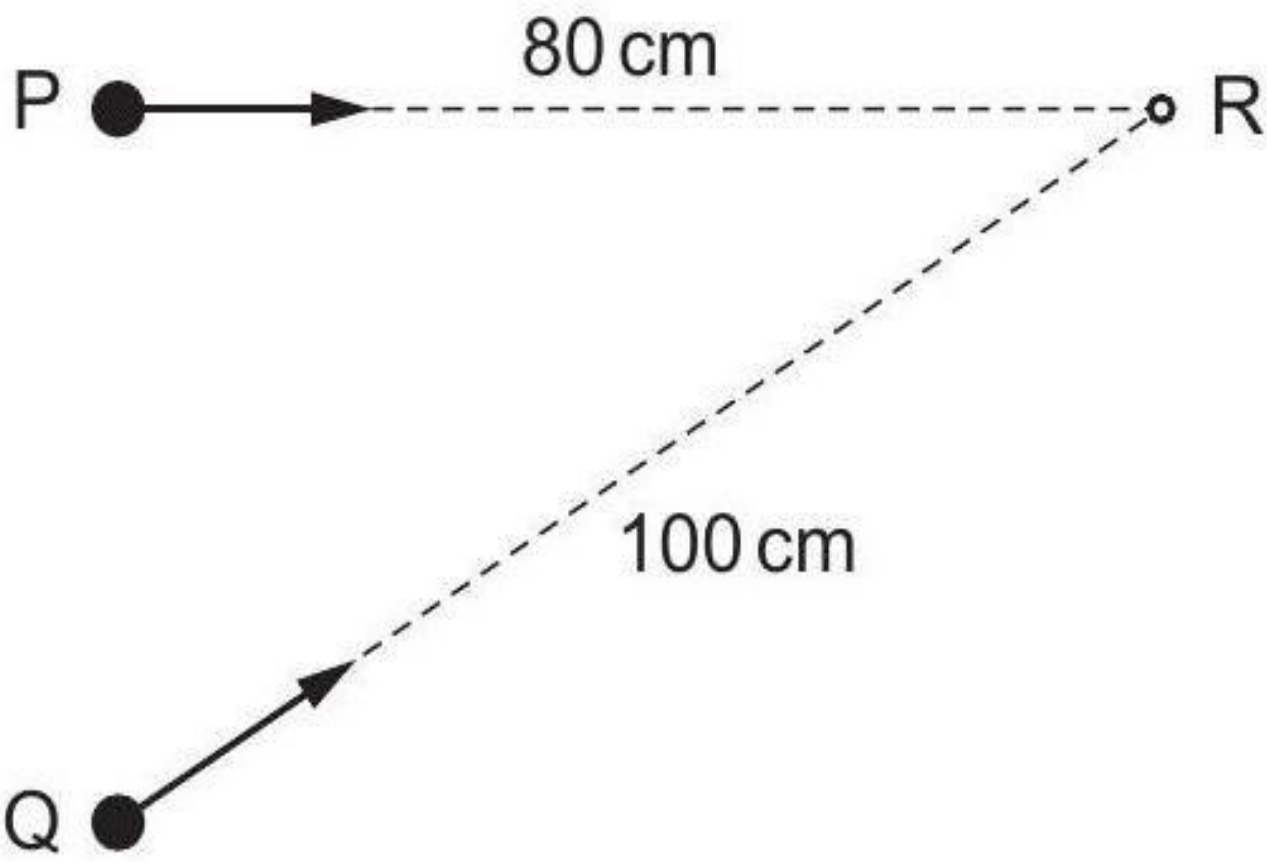
- 12)
27
- Two progressive waves travel in opposite directions and form a stationary wave. The graph shows the variation with distance  $x$  of the displacement of the stationary wave and of one of the two progressive waves at the same instant in time.



What are the approximate displacements of the **other** progressive wave at the positions J, K and L?

	displacement / mm		
	J	K	L
A	-5	0	-10
B	-5	+5	0
C	0	+5	+10
D	+5	-5	0

- 13)
21
- Two identical waves are produced by sources at points P and Q. The waves travel along different paths to reach point R, as shown.



Both waves have a wavelength of 6.0 cm. The waves are in phase at point R.

What is the phase difference between the waves as they leave points P and Q?

- A
B
C
D
- 0°
60°
90°
120°



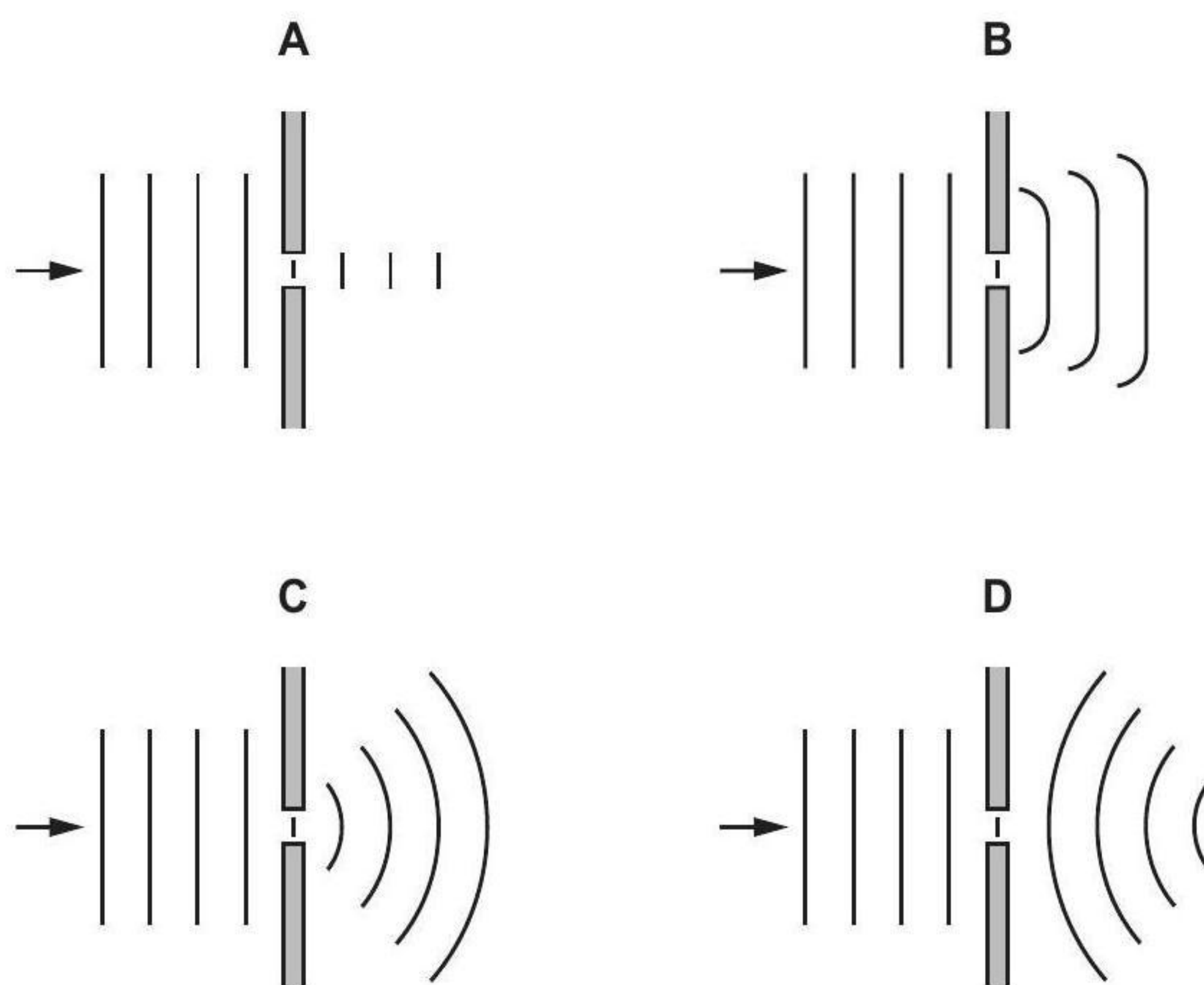
- 14)** 24 A stationary sound wave is formed in a pipe that is closed at one end and open at the other end. The wave has two antinodes. One of these antinodes is at the open end of the pipe.

The length of the pipe is 0.600 m. The speed of sound in the air column in the pipe is  $340 \text{ m s}^{-1}$ .

What is the frequency of the sound wave?

- A** 425 Hz      **B** 850 Hz      **C** 1130 Hz      **D** 2270 Hz

- 15)** 28 Which diagram shows the diffraction of water waves in a ripple tank?

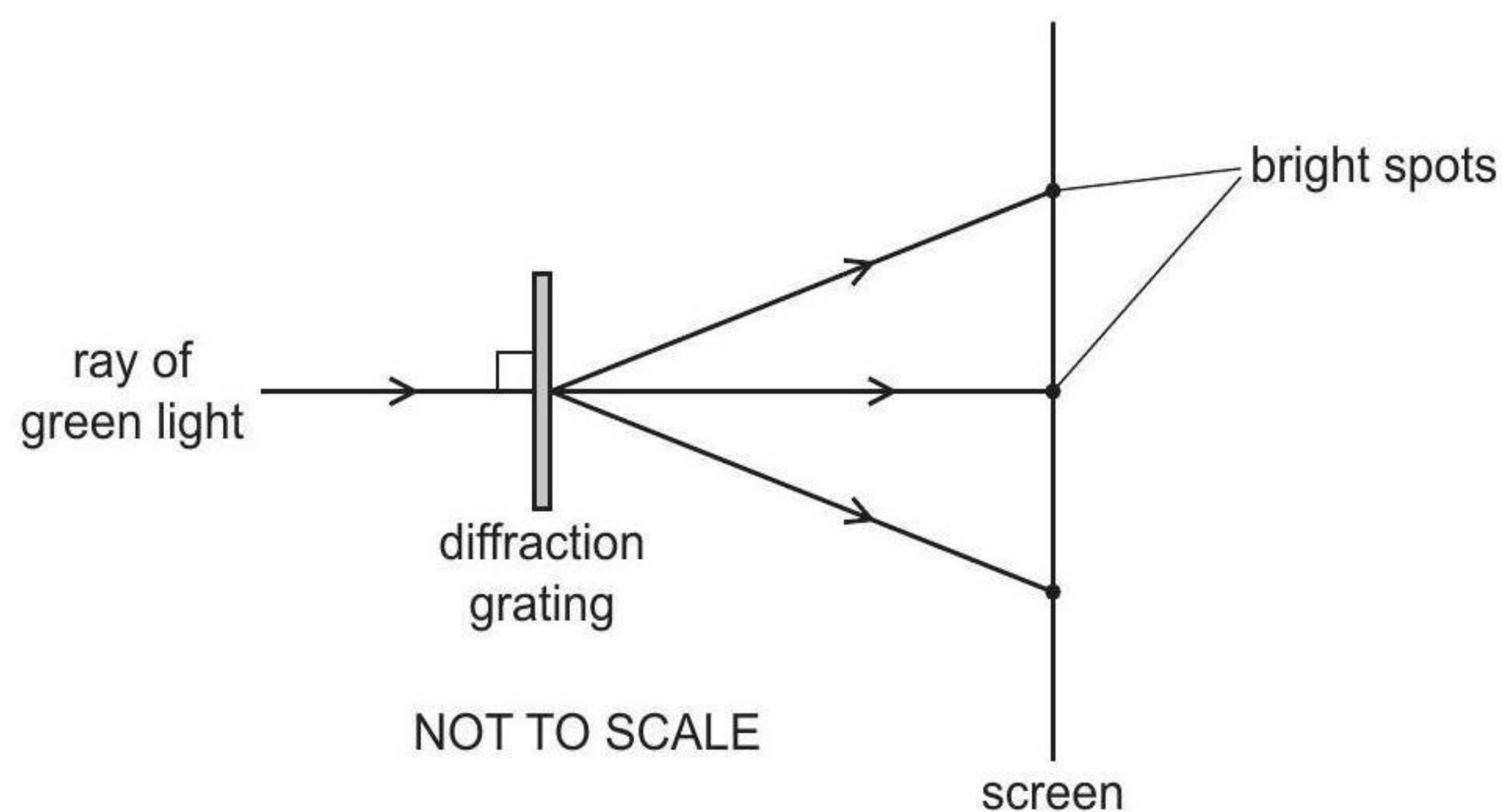


- 16)** 29 Interference fringes are produced on a screen by double-slit interference using light of wavelength 600 nm. The fringe separation is 4.0 mm and the separation of the slits is 0.60 mm.

What is the distance between the double slit and the screen?

- A** 0.25 m      **B** 0.40 m      **C** 2.5 m      **D** 4.0 m

- 17)** **30** A ray of green light is incident normally on a diffraction grating. Several bright spots are produced on a screen on the other side of the grating, as shown.



Which pair of changes could result in bright spots at exactly the same angles as previously?

- A** Use blue light and increase the distance between the grating and the screen.
- B** Use blue light and increase the number of lines per unit length in the grating.
- C** Use red light and increase the distance between the grating and the screen.
- D** Use red light and increase the number of lines per unit length in the grating.

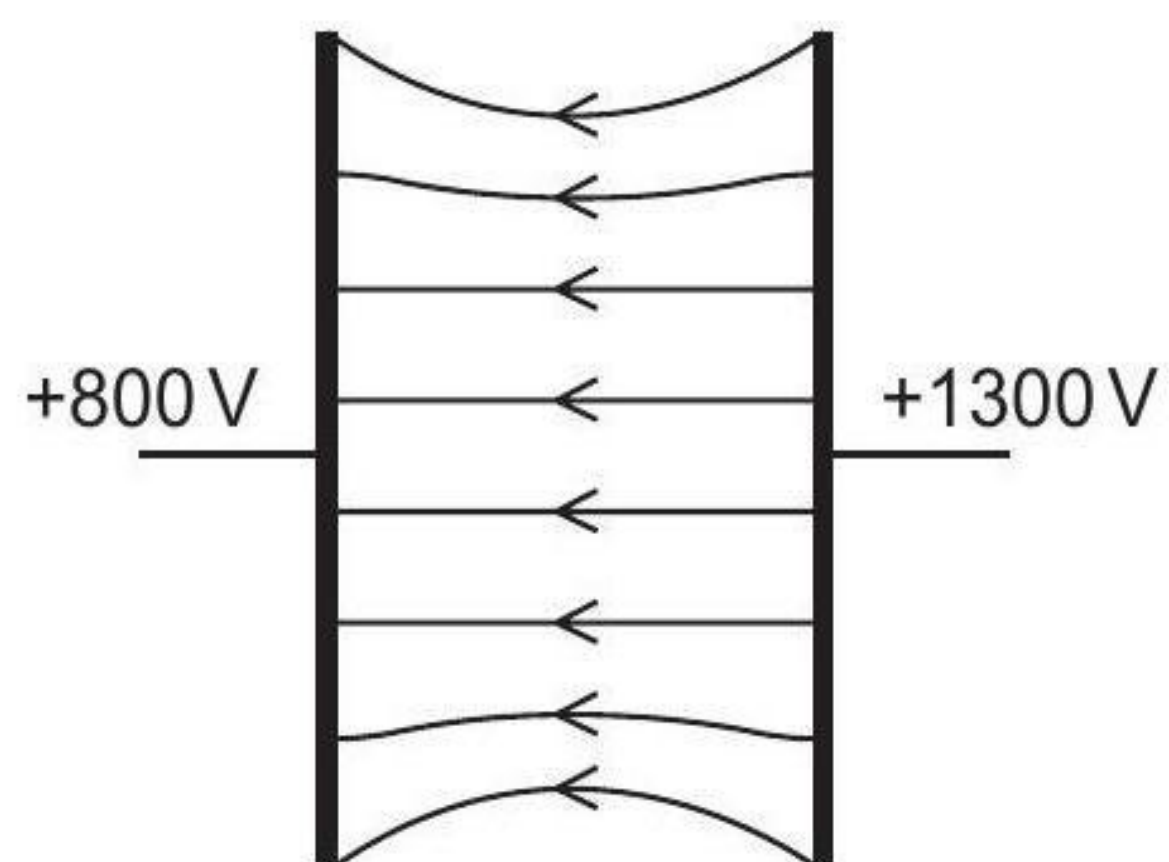


18)

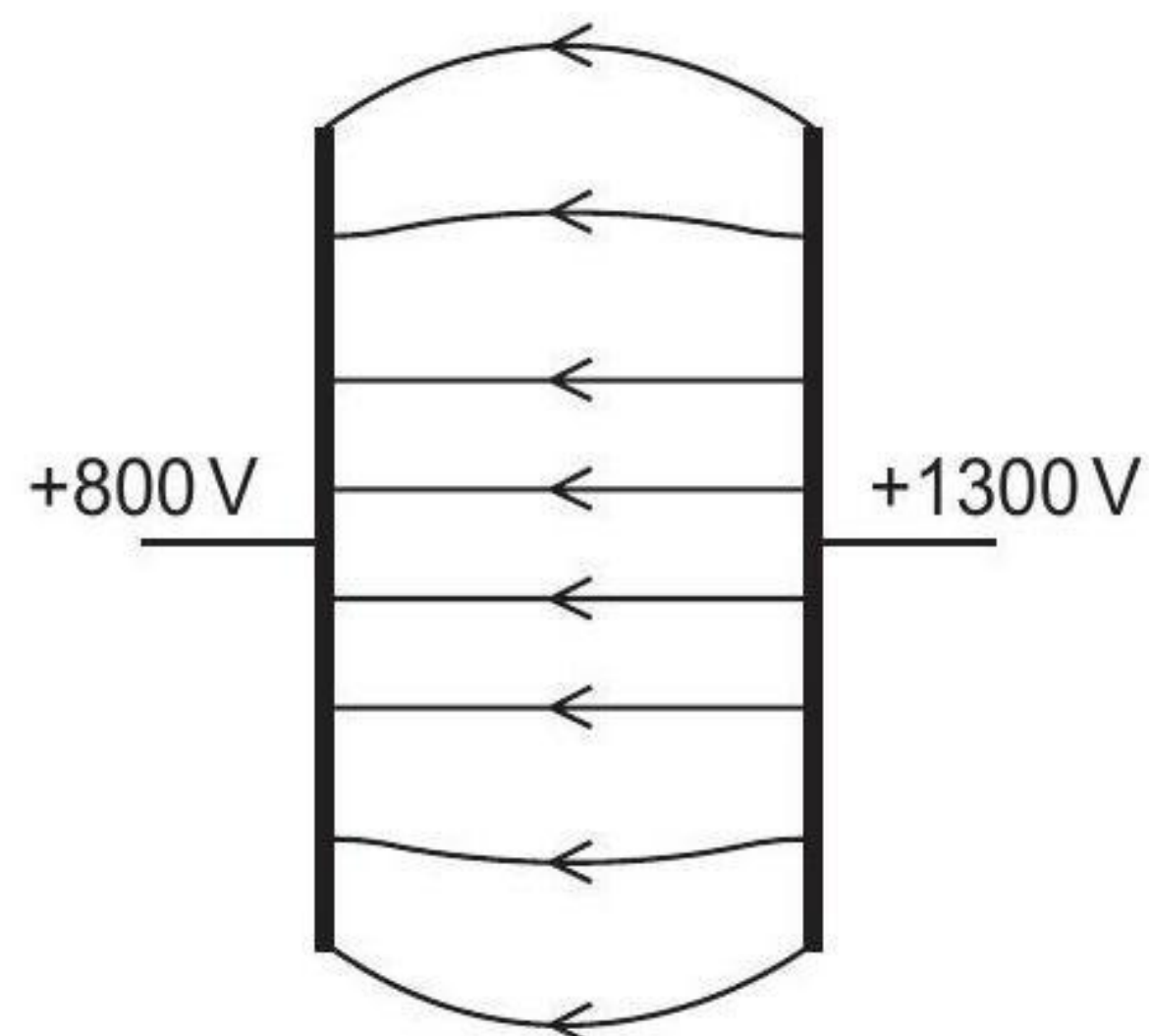
- 31 Two parallel metal plates are at electric potentials of  $+800\text{ V}$  and  $+1300\text{ V}$ .

Which diagram best represents the electric field between the metal plates?

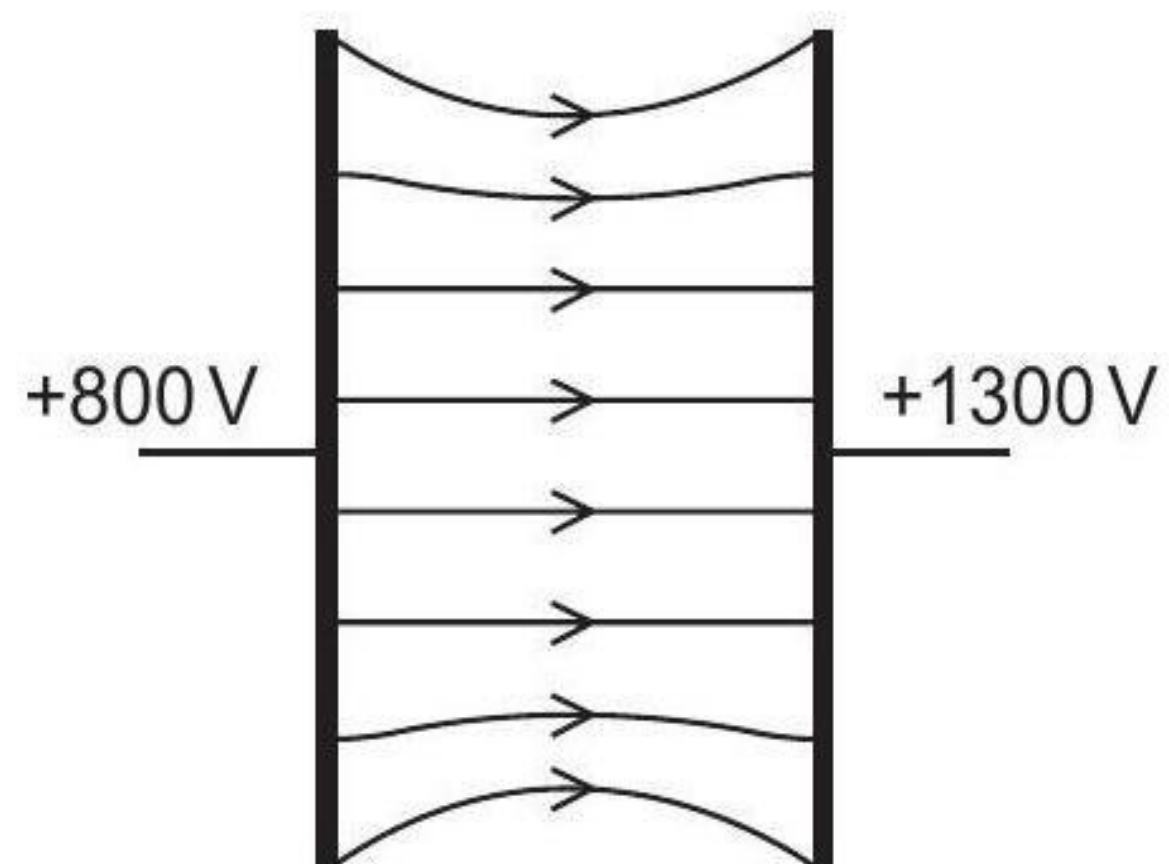
A



B



C



D

