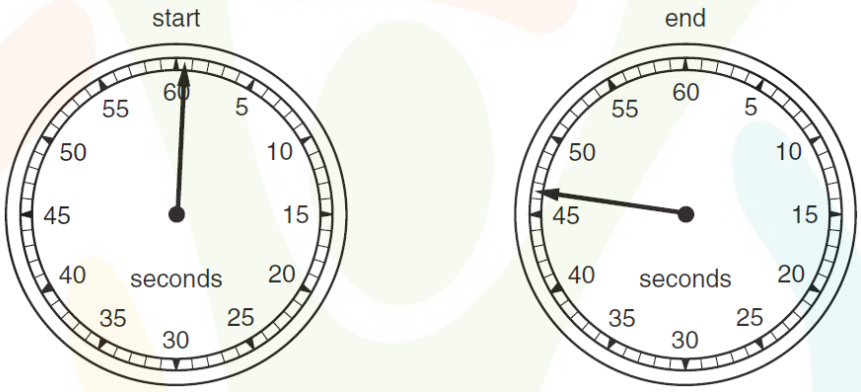
Brainiacs Physics Olympiad Preliminary Round Sample Exam Paper 3

Category I – grades 7 and 8

EASY

Q1.
A stopwatch is used to time a race. The diagrams show the watch at the start and at the end of the race. How long did the race take?



A. 45.7 s
B. 46.0 s
C. 46.5 s
D. 47.0 s

Q2.

Which quantities are both vectors?

A. acceleration and force
B. acceleration and pressure
C. density and force
D. density and pressure

Q3.

Which object has the greatest weight?

A. an object of mass 10 kg in a 15 N/kg gravitational field
B. an object of mass 15 kg in a 13 N/kg gravitational field
C. an object of mass 20 kg in a 9.0 N/kg gravitational field
D. an object of mass 50 kg in a 3.0 N/kg gravitational field

Q4.

A car is moving in a straight line on a level road. Its engine provides a forward force on the car. A second force of equal size acts on the car due to resistive forces. Which statement describes what happens?

A. The car changes direction.
B. The car moves at a constant speed.
C. The car slows down.
D. The car speeds up.

Q5.

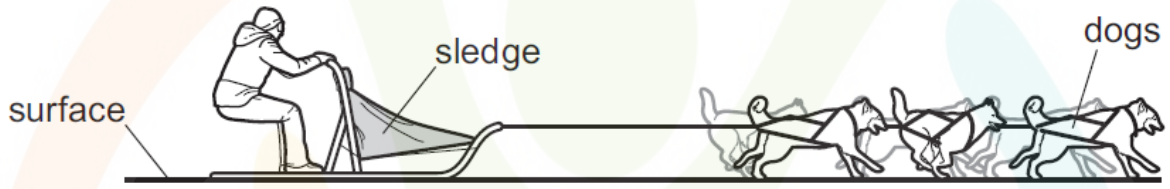
Which statement about ultrasound is correct?

A. It is produced by a rapidly vibrating source.
B. It is uncomfortable to human ears.
C. Its frequency must be greater than 300 kHz.
D. It travels the fastest in a vacuum.

NORMAL

Q6.

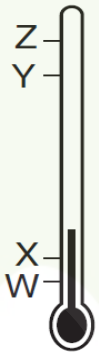
A sledge is pulled in a straight line by dogs, as shown. The dogs produce a total horizontal driving force of 600 N. The frictional force between the sledge and the surface is 150 N and the air resistance on the sledge is 450 N. What is the resultant force acting on the sledge?



A. 0 N B. 300 N C. 900 N D. 1200 N

Q7.

The top of the mercury thread in a mercury-in-glass thermometer reaches point X at 0 °C and point Z at 100 °C. Where might it be at a temperature below the ice-point?



A. point W
B. point X
C. point Y
D. point Z

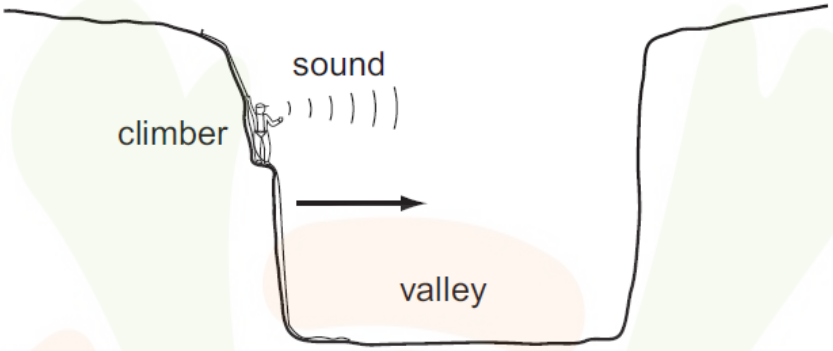
Q8.

Both the amplitude and the frequency of a sound wave decrease. What happens to the sound heard?

A. The sound is louder and has a higher pitch.
B. The sound is louder and has a lower pitch.
C. The sound is quieter and has a higher pitch.
D. The sound is quieter and has a lower pitch.

Q9.

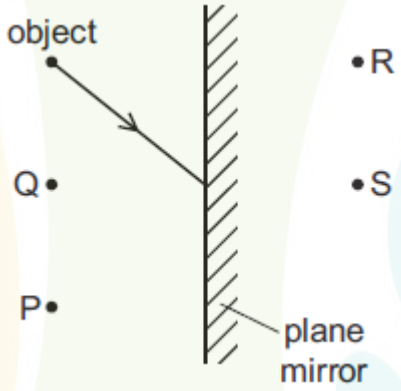
To estimate the width of a valley, a climber starts a stopwatch as he shouts. He hears an echo from the opposite side of the valley after 1.0 s. The sound travels at 340 m/s. What is the width of the valley?



A. 85 m B. 170 m C. 340 m D. 680 m

Q10.

The diagram shows an object in front of a plane mirror. A ray of light from the object is incident on the mirror. Through which point does the reflected ray pass, and at which point is the image of the object formed?



	point through which reflected ray passes	point at which image is formed
A	P	R
B	P	S
C	Q	R
D	Q	S

A

Q11.

A student uses a magnifying glass to examine a small insect. The magnifying glass forms an image of the insect that is upright and magnified. What type of lens is being used?

A. Concave lens
B. Diverging lens
C. Convex lens
D. Plane mirror

Q12.

When a plastic comb is placed next to a small piece of aluminium foil hanging from a nylon thread, the foil is repelled by the comb. Why is this?

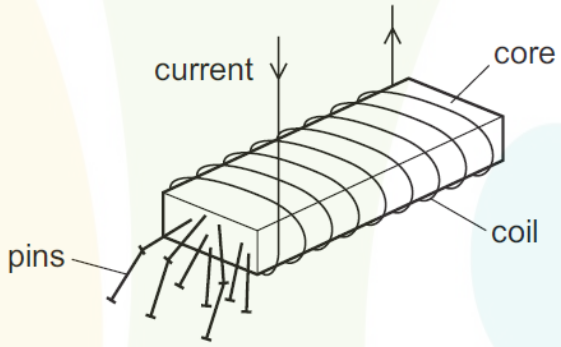
A. The comb is charged and the foil is uncharged.
B. The comb is uncharged and the foil is charged.
C. The comb and the foil have charge of opposite signs.
D. The comb and the foil have charge of the same sign.

Q13.

An electric circuit contains a battery, a resistor, and an ammeter. If the current is 2 A and the resistance is 5 Ω, what is the potential difference across the resistor?
A. 10 V
B. 0.4 V
C. 10 V
D. 5 V

Q14.

A strong electromagnet is used to attract pins. What happens when the current in the coil is halved?



A. No pins are attracted.
B. Some pins are attracted, but not as many.
C. The same number of pins is attracted.
D. More pins are attracted.

Q15.

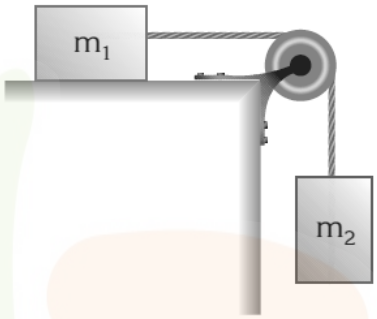
An atom of lithium contains three protons and three electrons. The nucleon number (mass number) of the atom is 7. How many neutrons are there in the atom?

A. 3 B. 4 C. 7 D. 10

DIFFICULT

Q16.

A frictionless system consisting of masses $m_1 = 2.5$ kg and $m_2 = 1$ kg is shown in the figure below. If the system is released from rest, what is the acceleration of the system? (Take *g=10 N/kg*)



A. 0.25 m/s^2 B. 4 m/ s^2 C. 6 m/ s^2 D. 10 m/ s^2

Q17.

A spring, which obeys Hooke's law, has an unstretched length of 10 cm. A load of 20 N is suspended from the spring. The new length of the spring is 36 cm. What is the spring constant *k* of the spring?

A. 0.56 N/cm B. 0.77 N/cm C. 1.3 N/cm D. 1.8 N/cm

Q18.

An object in a space probe above the Earth weighs 3.5 N. The gravitational field strength at the height of the space probe is 7.0 N/kg. The gravitational field strength on the Earth's surface is 10 N/kg. What are the mass and the weight of the object on the Earth's surface?

	mass / kg	weight / N
A	0.50	3.5
B	0.50	5.0
C	2.0	3.5
D	2.0	20

B

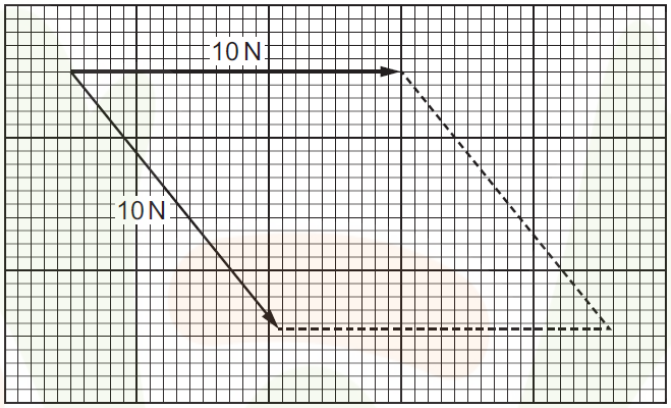
Q19.

A person uses a surfboard to ride every 30th wave crest towards the beach. The wave crest travels at a speed of 1.6 m/s and the distance between each wave crest is 24 m. How many wave crests does the person surf in one hour?

A. 1 B. 2 C. 8 D. 450

Q20.

The diagram shows an incomplete scale drawing to find the resultant of two 10 N forces acting at a point in the directions shown. What is the magnitude of the resultant force?



A. 7.5 N B. 8.6 N C. 18 N D. 20 N