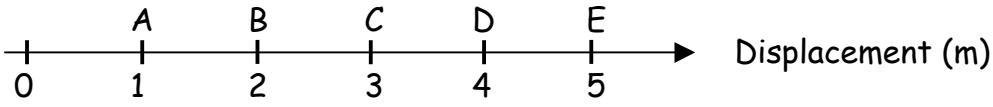
Physics Diagnostic Questions

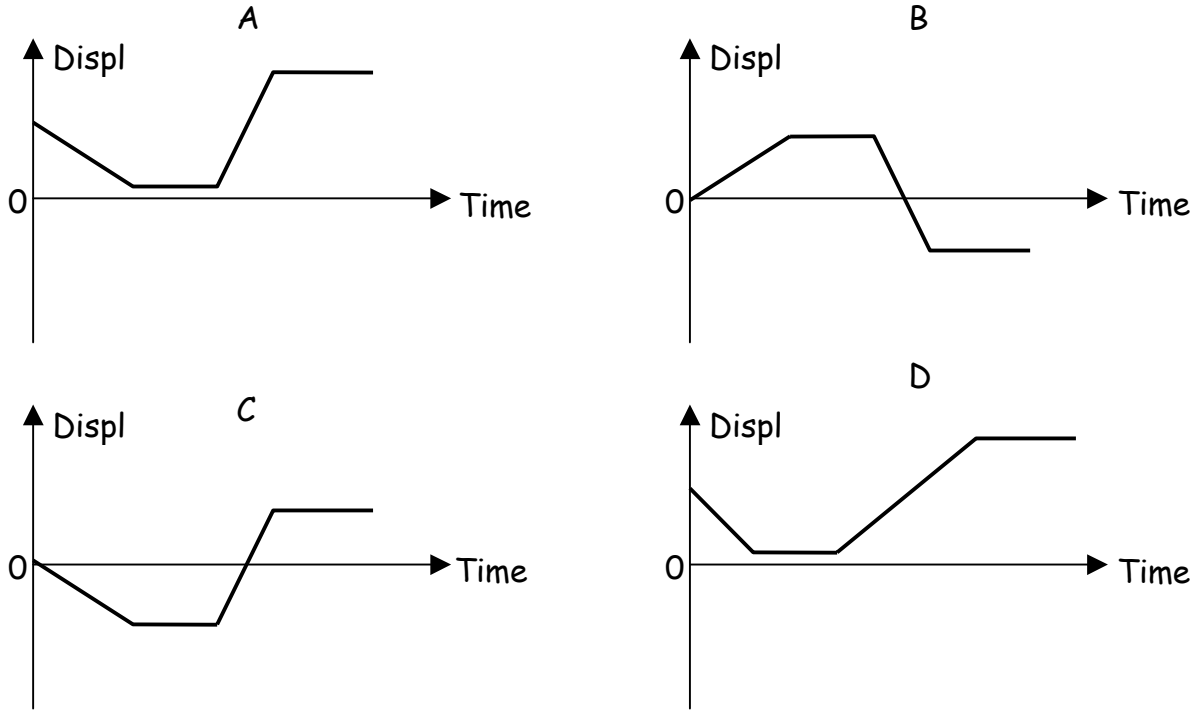
Here are 40 multiple choice questions that you will be able to answer after participating in the Physics Bridging Course. If you correctly answer **less than 25 questions**, then you need to do this course!

1. Which of the following quantities is a SCALAR?
   (a) acceleration
   (b) displacement
   (c) average speed
   (d) average velocity

2. A person initially at point C (in the diagram below) walks along a straight line to A, remains there for a short time and then runs to E and rests there for a while.

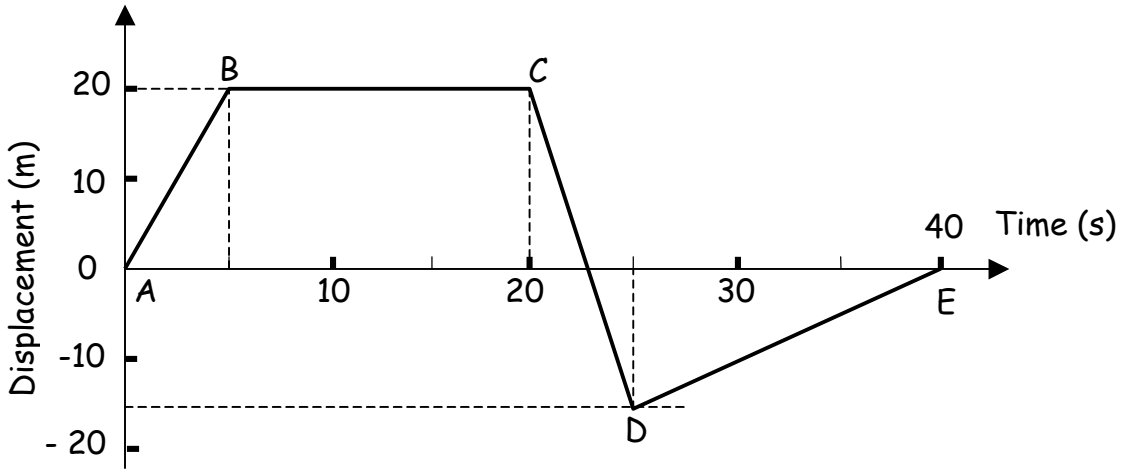


Which of the displacement-time graphs below correctly represents this motion?



Questions 3 to 5 refer to the graph below:

An object is moving along a straight line as represented in the graph below, which shows its displacement as a function of time. Various segments of the graph are labelled.



3. In which segment of the graph does the object have the highest speed?

   (a) AB

   (b) BC

   (c) CD

   (d) DE

4. During which interval(s) is the object moving in the negative direction?

   (a) CD only

   (b) BC and CD

   (c) CD and DE

   (d) DE only

5. Which segment of the graph represents a constant velocity of 1.0 ms^{-1} ?

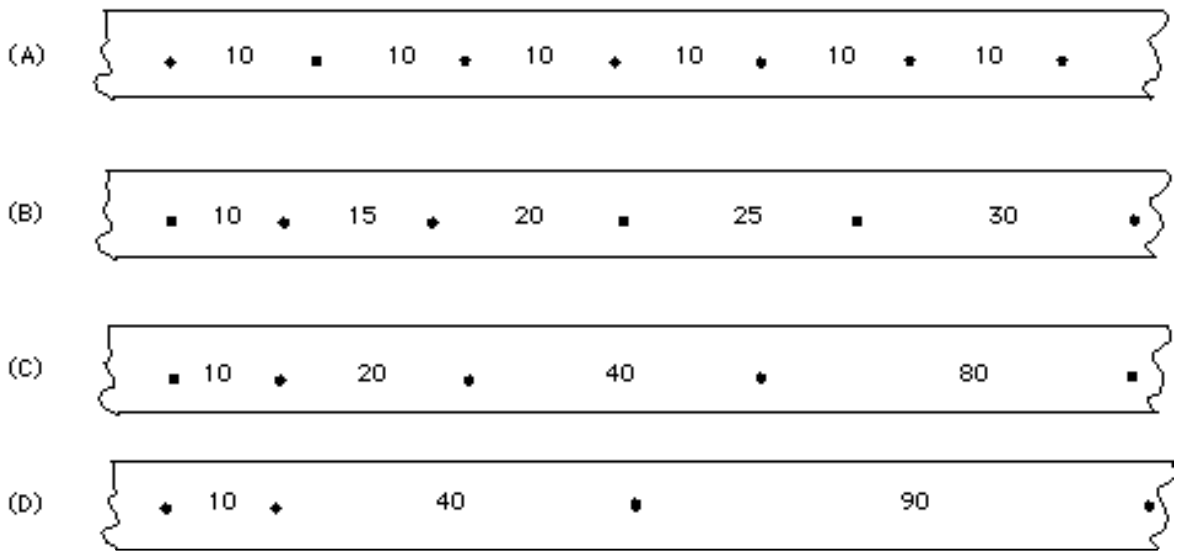
   (a) AB

   (b) BC

   (c) CD

   (d) DE

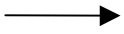
6. A paper tape is attached to a trolley moving with uniform acceleration. The distance between dots indicates in centimetres the distance moved in equal time intervals of one second. Which diagram shows the dots correctly marked?



7. Two vectors X and Y are represented below

Which one of the following vectors best represents the vector X + Y?

(a)

(b) 

(c) 

(d) 

8. Two displacement vectors of magnitude 20 cm and 50 cm are added. Which one of the following is the ONLY possible choice for the magnitude of the resultant?

   (a) zero

   (b) 25 cm

   (c) 60 cm

   (d) 80 cm

9. An object moves along a straight line and accelerates at 3 ms^{-2}. This means that the object,

   (a) travels 3 metres in each second

   (b) travels 3 metres during the first second only

   (c) increases its speed by 3 ms^{-1} each second

   (d) increases its acceleration by 3ms^{-2} in each second

10. When an object is released from rest and falls with negligible air friction near the earth's surface, which of the following statements concerning its motion is true?

   (a) its acceleration is constant

   (b) its velocity is constant

   (c) neither its acceleration nor velocity is constant

   (d) both its acceleration and velocity are constant

Question 11 and 12 refer to the following information

A stone dropped from rest down a mine shaft takes 4 seconds to reach the bottom. Assume that the acceleration due to gravity is 10 ms^{-2} and neglect air friction.

11. What is the depth of the mine shaft?

   (a) 20 m

   (b) 40 m

   (c) 60 m

   (d) 80 m

12. What is the magnitude of the velocity of the stone at the instant before striking the bottom?

    (a) 20 ms^{-1}

    (b) 40 ms^{-1}

    (c) 60 ms^{-1}

    (d) 80 ms^{-1}

13. The weight of an object

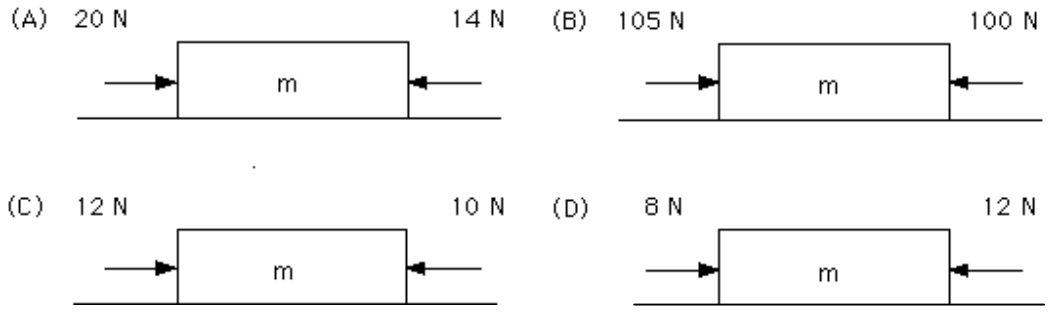
    (a) is the quantity of matter it contains

    (b) refers to its inertia

    (c) is basically the same quantity as its mass but expressed in different units

    (d) is the force with which it is attracted to the earth.

14. Which system of forces shown below gives mass m the greatest acceleration?



15. Under what condition(s) will an object be in equilibrium?

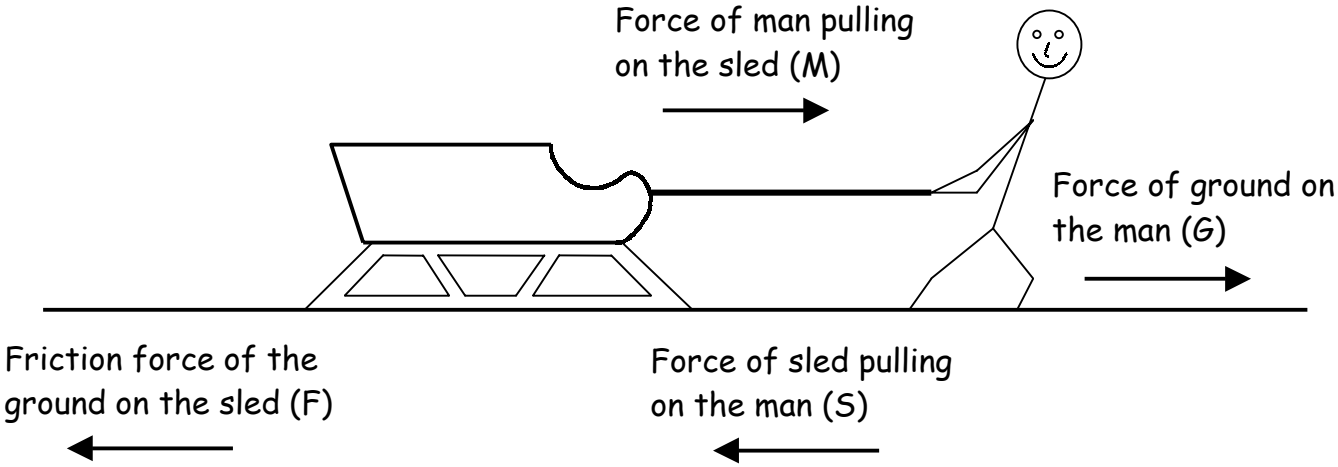
    (a) If it is either at rest or moving with constant velocity

    (b) If it is either moving with constant velocity or with constant acceleration

    (c) Only if it is at rest

    (d) Only if it is moving with constant acceleration

16. A man pulls a sled on a horizontal snow surface as sketched below.



Which two forces form an "action-reaction" pair, which obey Newton's third law?

(a) F and G

(b) F and S

(c) M and S

(d) S and G

17. A rock is thrown straight up from the earth's surface and reaches a great height. Which one of the following statements describes the energy transformation of the rock as it falls? Neglect air resistance.

(a) The total energy of the rock increases

(b) The kinetic energy decreases and the potential energy increases

(c) Both the potential and kinetic energies of the rock remain the same

(d) The kinetic energy increases and the potential energy decreases

18. Light bends when travelling from air into water because of a change in,

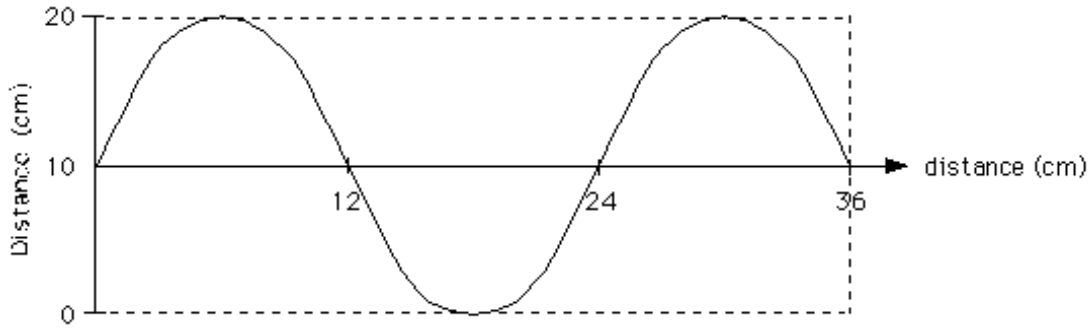
(a) amplitude

(b) colour

(c) speed

(d) frequency

Questions 19 and 20 refer to the following wave "photograph" of a water wave.



19. What is the amplitude of the water wave?

    (a) 10 cm

    (b) 12 cm

    (c) 20 cm

    (d) 24 cm

    (e) 36 cm

20. If the water waves have a velocity of 48 cms^{-1}, what is the frequency of the wave (in hertz)?

    (a) 0.25

    (b) 0.5

    (c) 1.0

    (d) 2.0

21. So as to produce beats, two waves should:

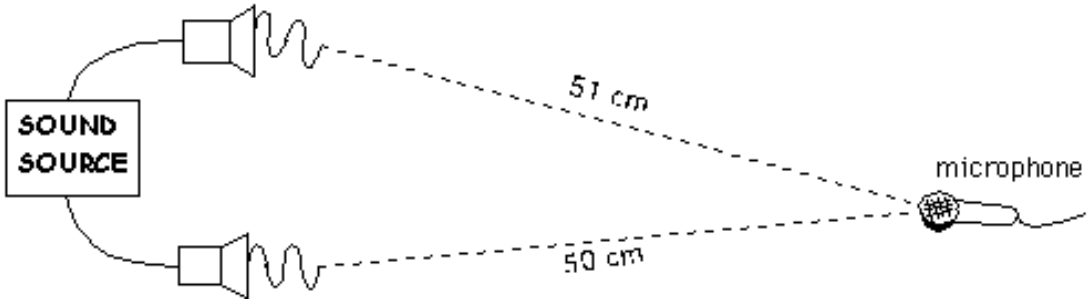
    (a) be travelling in opposite direction

    (b) be travelling with different speeds

    (c) have slightly different amplitudes

    (d) have slightly different frequencies

22. A source is adjusted to produce sound waves in both loudspeakers of wavelength 2 cm. The sound waves are in step with one another when leaving the loudspeakers but travel different distances to the microphone as shown. (Note, the microphone measures the sound intensity at that point).



At the microphone in the position shown,

(a) no sound will be detected

(b) a very loud sound will be detected

(c) the sound intensity will fluctuate slowly

(d) a loud sound is detected at first, but then gradually decays.

23. Which on of the following types of waves has a different nature from the other three?

(a) Visible light

(b) Ultrasound waves

(c) Gamma rays

(d) Ultraviolet radiation

24. Which of the following statements gives the best interpretation of the experimental results of scattering of alpha particles by thin gold foil conducted by Rutherford and his colleagues?

(a) The atom contains a dense, positively charged nucleus

(b) The atom has electrons arranged in well defined shells

(c) The numerous electrons in the gold foil deflected the alpha particles

(d) The atom consists of protons and electrons

25. Which one of the following statements concerning electromagnetic waves is FALSE?

    (a) Electromagnetic waves carry energy

    (b) X rays have longer wavelengths than radio waves

    (c) In a vacuum, all electromagnetic waves travel at the same speed

    (d) Gamma ray photons are more energetic than ultraviolet photons

26. An individual copper atom emits electromagnetic radiation with wavelengths that are

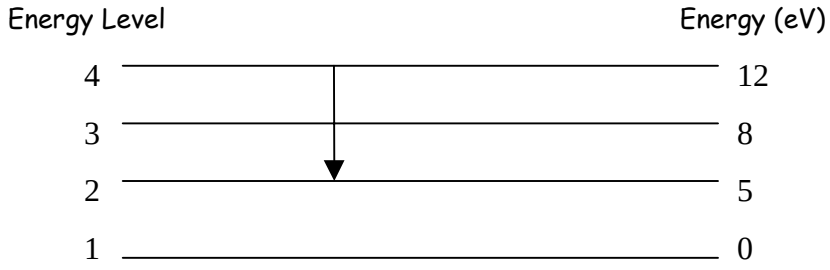
    (a) evenly spaced across the spectrum

    (b) unique to that particular copper atom

    (c) the same as those of all elements

    (d) unique to all copper atoms

27. When an electron jumps from energy level 4 to energy level 2 as shown in the diagram below,



    (a) a photon of energy 7eV is emitted

    (b) a photon of energy 7eV is absorbed

    (c) photons of energy 3eV and 4 eV are emitted

    (d) photons of energy 3eV and 4 eV are absorbed

28. A material that allows a current to flow in it is called a(n)

    (a) insulator

    (b) conductor

    (c) capacitor

    (d) inductor

29. When an ebonite rod is rubbed with a piece of fur, the rod becomes negatively charged as,

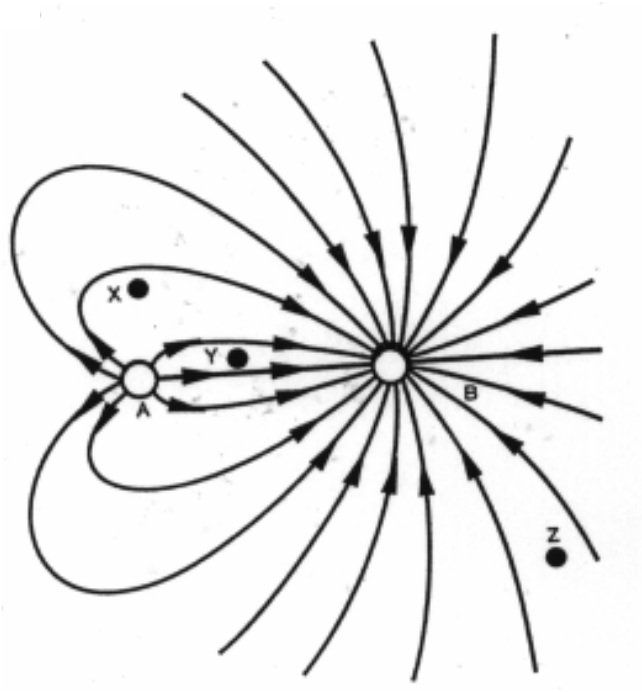
    (a) positive charges are transferred from the rod to the fur

    (b) negative charges are transferred from the fur to the rod

    (c) negative charges are created on the surface of the rod

    (d) positive charges are transferred from the fur to the rod

Questions 30 and 31 refer to the following electric field pattern produced by two charges A and B.



30. The sign of the charges A and B are respectively,

    (a) positive, negative

    (b) positive, positive

    (c) negative, negative

    (d) negative, positive

31. The electric field intensity is greatest at

    (a) point X

    (b) point Y

    (c) a point midway between X and Y

    (d) point Z

32. When the electric charge on each of two charged objects is doubled, the electric forces between them is

    (a) halved

    (b) the same

    (c) doubled

    (d) quadrupled

33. Points P and Q are at a certain distance from a charged object such that the potential difference between P and Q is 50 volts.

    How much work is required to move a positive charge of 1 mC from P to Q?

    (a) 5000 J

    (b) 1000 J

    (c) 0.05 J

    (d) 0.02 J

34. How many coloumbs of charge pass through a conductor when a current of 5 amps flows in it for 2 minutes?

    (a) 0.4

    (b) 2.5

    (c) 10

    (d) 600

35. Which of the following statements concerning resistance is true?

    (a) Resistance is a property of resistors, but not conductors

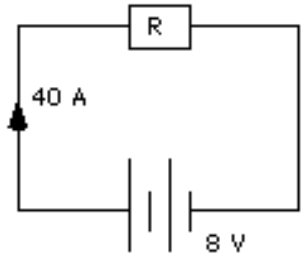
    (b) The resistance of a metal wire increases with temperature

    (c) The resistance is the same for all sizes of the same material

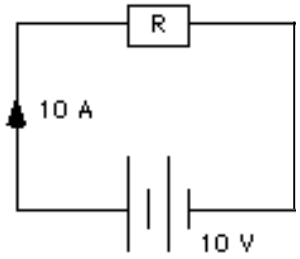
    (d) The resistance of a wire is inversely proportional to the length of the wire

36. Which one of the following circuits has the largest resistance?

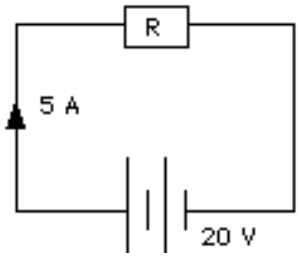
(A)



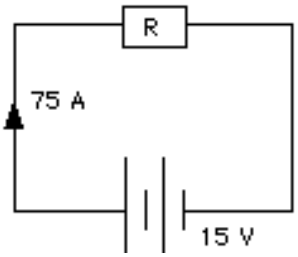
(B)



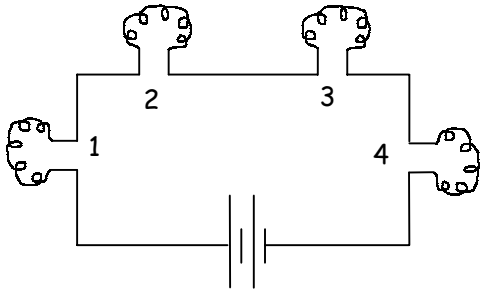
(C)



(D)



37.



In the circuit shown above, all four bulbs are identical. How do the brightness of the bulbs compare?

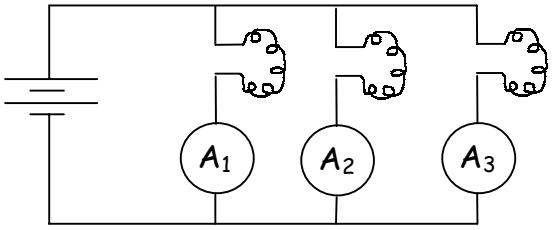
(a) Bulb 1 is brightest

(b) Bulb 4 is brightest

(c) Bulbs 1 and 2 are brighter than 3 and 4

(d) All bulbs are equally bright

38. All the lamps in the circuit below are identical and of equal brightness



If the ammeter A_3 reads 0.1 A, what does the ammeter A_1 read?

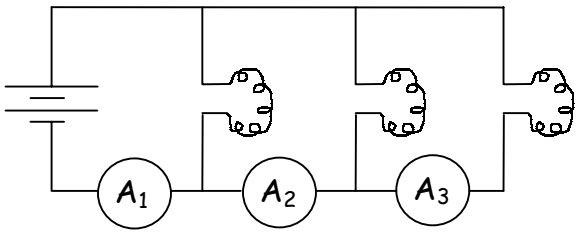
(a) 0.1 A

(b) 0.2 A

(c) 0.3 A

(d) 0.4 A

39. In the accompanying circuit, all the lamps have identical resistances and are of equal brightness.



If the ammeter A_1 reads 3.0 A, then ammeter A_3 reads

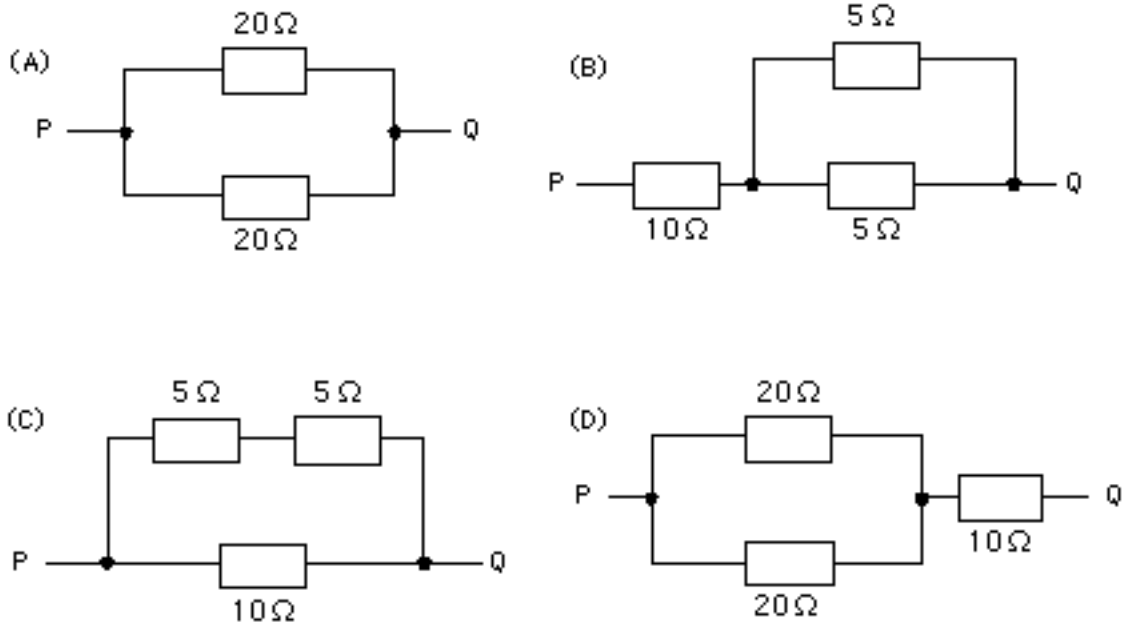
(a) zero

(b) 1.0 A

(c) 2.0 A

(d) 3.0 A

40. Which arrangement below is equivalent to a resistance of 20 Ω between P and Q?



Answers

(If you score less than 25, then you need to do the Physics Bridging course!)

1 c	2 a	3 c	4 a	5 d	6 b	7 a
8 c	9 c	10 a	11 d	12 b	13 d	14 a
15 a	16 c	17 d	18 c	19 a	20 d	21 d
22 a	23 b	24 a	25 b	26 d	27 a	28 b
29 b	30 a	31 b	32 d	33 c	34 d	35 b
36 c	37 d	38 a	39 b	40 d		