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535/1
PHYSICS
PAPER 1
July/August 2022
2¼ hours

BURST THE BRAIN NATIONAL MOCK



Uganda Certificate of Education PHYSICS PAPER 1 2hours 15minutes

Instructions to candidates:

- The paper consists of two sections, A and B. Attempt *all* questions in section A and B.
- Section A contains 40 objective type questions. You are required to write a letter A, B, C or D in the answer grid below.
- Section B has got 10 structured questions. Answers to this section are to be written in the spaces provided on the question paper.
- Mathematical tables, slide rules and silent non-programmable electronic scientific calculators may be used.

Assume where necessary

Acceleration due to gravity, g	=	10ms^{-1}
Specific heat capacity of water	=	$4200\text{Jkg}^{-1}\text{K}^{-1}$
Specific heat capacity of ice	=	$2100\text{Jkg}^{-1}\text{K}^{-1}$
Specific latent heat of fusion of ice	=	$336,000\text{Jkg}^{-1}$
Speed of light in vacuum, c	=	$3.0 \times 10^8\text{ms}^{-1}$

ANSWERS FOR SECTION A;

1		9		17		25		33	
2		10		18		26		34	
3		11		19		27		35	
4		12		20		28		36	
5		13		21		29		37	
6		14		22		30		38	
7		15		23		31		39	

8		16		24		32		40	
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1. Which pair contains one vector and one scalar quantity?

- A. displacement, acceleration
- B. force, kinetic energy
- C. momentum, velocity
- D. power, speed

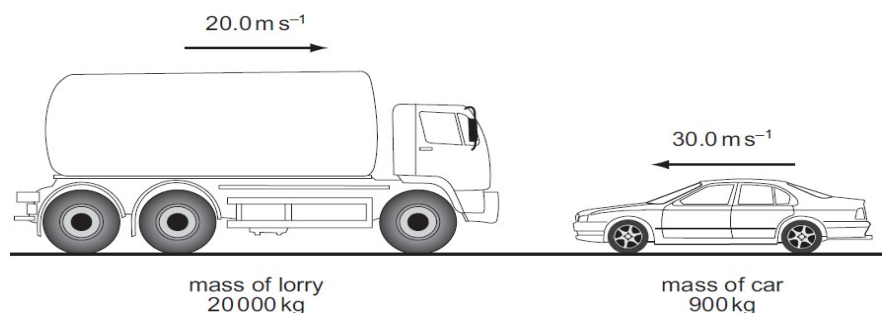
2. Which of the following could be measured in the same units as force?

- A energy / distance
- B energy x distance
- C energy / time
- D momentum x distance

3. A car is travelling with uniform acceleration along a straight road. The road has marker posts every 100m. When the car passes one post, it has a speed of 10ms^{-1} and, when it passes the next one, its speed is 20ms^{-1} . What is the car's acceleration?

- A 0.67 m s^{-2}
- B 1.5 m s^{-2}
- C 2.5 m s^{-2}
- D 6.0 m s^{-2}

4. The diagram shows a situation just before a head-on collision. A lorry of mass 20 000 kg is travelling at 20.0 m s^{-1} towards a car of mass 900 kg travelling at 30.0ms^{-1} towards the lorry.



What is the magnitude of the total momentum?

- A 373kN
- B 427kN
- C 3600kN
- D 4410kN

5. An object, immersed in a liquid in a tank, experiences an upthrust.

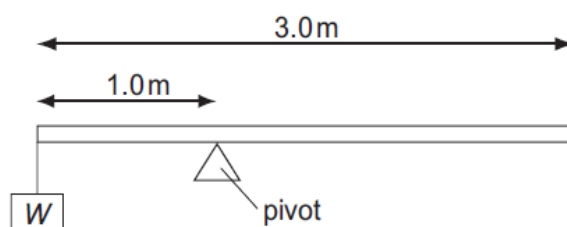
What is the physical reason for this upthrust?

- A density of the body differs from that of the liquid.
- B The density of the liquid increases with depth.
- C The pressure in the liquid increases with depth.
- D The value of g in the liquid increases with depth.

6. Which observation indicates that sound waves are longitudinal?

- A Sound can be reflected from a solid surface.
- B Sound cannot be polarised.
- C Sound is diffracted around corners.
- D Sound is refracted as it passes from hot air to cold air.

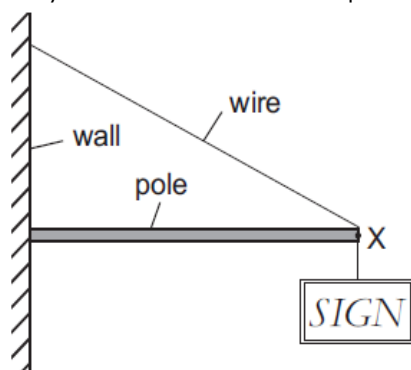
7. A uniform beam of weight 50N is 3.0m long and is supported on a pivot situated 1.0m from one end. When a load of weight W is hung from that end, the beam is in equilibrium, as shown in the diagram.



What is the value of W ?

- A 25 N
- B 50 N
- C 75 N
- D 100 N

8. The diagram shows a sign of weight 20 N suspended from a pole, attached to a wall. The pole is kept in equilibrium by a wire attached at point X of the pole.



Which of the following is a tie?

- A wire B pole C wall D sign

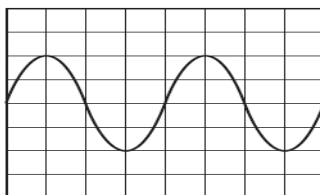
9. Isotopes of a given element all have the same

- A charge / mass ratio. B neutron number.
C nucleon number. D proton number.

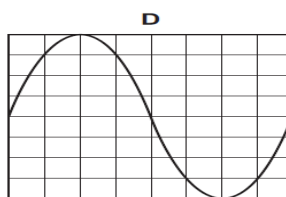
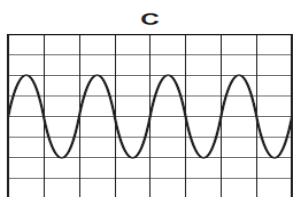
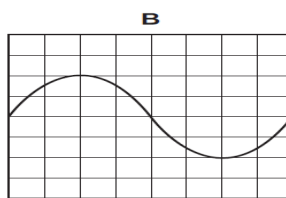
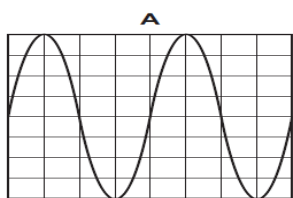
10. A nuclide of Polonium $^{210}_{84}\text{Po}$ decays by emission of an alpha particle. Which of the nuclides below is the correct product?

- A. $^{212}_{84}\text{Y}$ B. $^{214}_{82}\text{Y}$ C. $^{210}_{86}\text{Y}$ D. $^{206}_{82}\text{Y}$

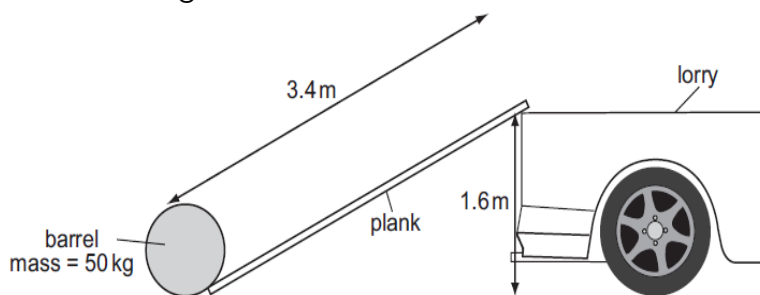
11. The following trace is seen on the screen of a cathode-ray oscilloscope. The setting of the time base is then changed from 10ms cm^{-1} to 20ms cm^{-1} and the Y-sensitivity is unaltered.



Which trace is now seen on the screen?



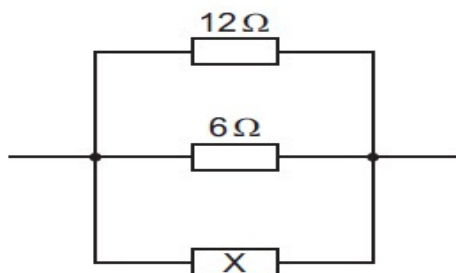
12. A barrel of mass 50 kg is loaded onto the back of a lorry 1.6 m high by pushing it up a smooth plank 3.4 m long.



What is the minimum work done?

- A. 80 J B. 170 J C. 780 J D. 1700 J

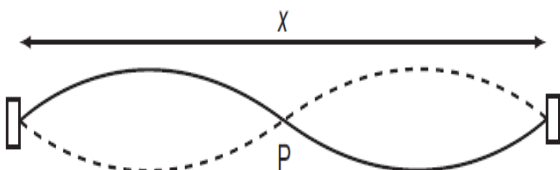
13. The diagram shows a parallel combination of three resistors. The total resistance of the combination is $3\ \Omega$.



What is the resistance of resistor X?

- A. $2\ \Omega$ B. $3\ \Omega$ C. $6\ \Omega$ D. $12\ \Omega$

14. The diagram represents a stationary wave on a stretched string.



What is represented by point P and by the length x?

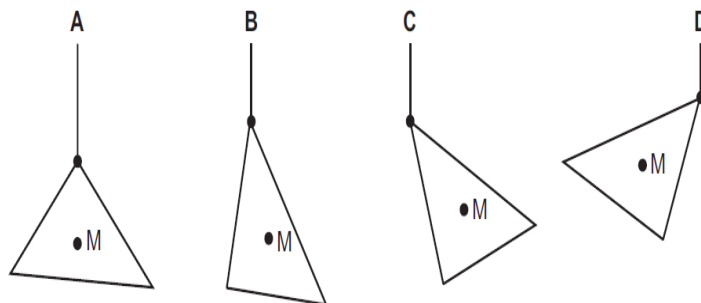
- A. antinode one wavelength B. antinode two wavelengths
C. node one wavelength D. node two wavelengths

15. Which statement applies to the boiling but not to the evaporation of a liquid?

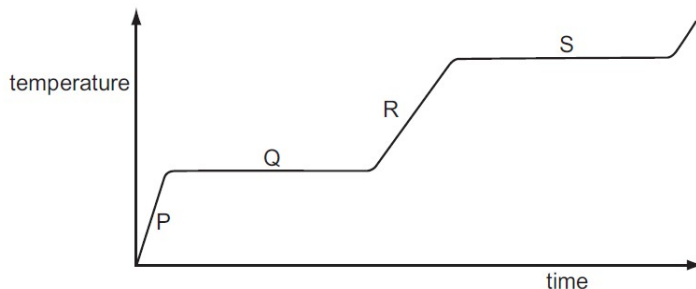
- A. All the bonds between molecules in the liquid are broken.
B. At normal atmospheric pressure, the process occurs at one temperature only.
C. Energy must be provided for the process to happen.
D. The separation of the molecules increases greatly.

16 A piece of card has its centre of mass at M.

Which diagram shows how it hangs when suspended by a thread?



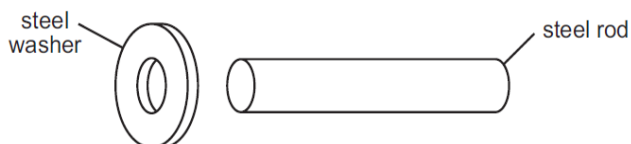
16. A substance is heated at a steady rate. It changes from a solid to a liquid, and then to a gas. The graph shows how its temperature changes with time.



Which parts of the graph show a change of state taking place?

- A. P and R
- B. P and S
- C. Q and R
- D. Q and S

17. An engineer wants to fix a steel washer on to a steel rod. The rod is just too big to fit into the hole of the washer.



How can the engineer fit the washer onto the rod?

- A. cool the washer and put it over the rod
- B. cool the washer and rod to the same temperature and push them together
- C. heat the rod and then place it in the hole
- D. heat the washer and place it over the rod

18. How can a permanent magnet be demagnetised?

- A. cool the magnet for a long time
- B. hit the magnet repeatedly with a hammer
- C. leave the magnet in a coil which carries direct current
- D. pass a small current through the magnet

19. An electromagnet is used to separate magnetic metals from non-magnetic metals. Why is steel unsuitable as the core of the electromagnet?

- A. It is a good conductor of electricity.
- B. It forms a permanent magnet.
- C. It has a high density.
- D. It has a high thermal capacity.

20. A polythene rod repels an inflated balloon hanging from a nylon thread.

What charges must the rod and the balloon carry?

- A. The rod and the balloon carry opposite charges.
- B. The rod and the balloon carry like charges.
- C. The rod is charged but the balloon is not.
- D. The balloon is charged but the rod is not.

21. Which statement is correct?

- A. A fuse is included in a circuit to prevent the current becoming too high.
- B. A fuse should be connected to the neutral wire in a plug.
- C. An electric circuit will only work if it includes a fuse.
- D. An earth wire is needed to prevent the fuse blowing.

22. A step-down transformer changes 240V a.c. to 12V a.c. There are 600 turns on the primary coil. How many turns are on the secondary coil?

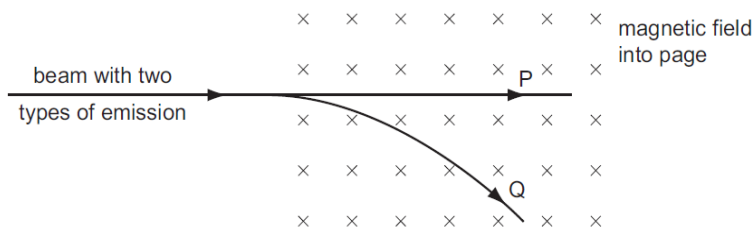
- A. 20
- B. 30
- C. 600
- D. 12 000

23. Why are high voltages and low currents used to transmit electrical energy over long distances?

- A. to increase the electromagnetic radiation
- B. to increase the speed at which electrons move
- C. to reduce heat loss from the power line
- D. to reduce the resistance of the power line

24. Two types of emission from a radioactive source are separated by passing them through a magnetic field.

The deflections are shown in the diagram.



What are the emissions P and Q?

	emission P	emission Q
A	alpha-particles	gamma-rays
B	beta-particles	gamma-rays
C	gamma-rays	alpha-particles
D	gamma-rays	beta-particles

25. Which of the following is not true about X-rays?

- A. They travel in straight lines
- B. They produce ionization
- C. They are deflected in electric and magnetic fields
- D. They affect a photographic plate

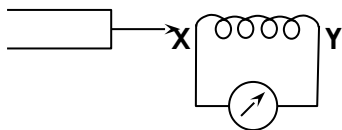
26. An electric heater supplies 3000J of heat energy in 5 minutes. The power developed by the heater is?

- A. 10W
- B. 20W
- C. 60W
- D. 6kW

27. What is the cost of running six 75W bulbs for 5 hours if the cost of electricity is 200/= per unit?

- A. 45,000/= B. 8,800/= C. 4,500/= D. 450/=

28.



The above figure shows a coil connected to a center zero galvanometer, G. The poles produced at the ends X and Y of the coil when the North pole of a magnet approaches it is ...

- | | | |
|----|----------------|----------------|
| A. | X – North pole | Y – South pole |
| B. | X – South pole | Y – North pole |
| C. | X – North pole | Y – North pole |
| D. | X – South pole | Y – South pole |

29. A magnetic material can be magnetized by ...

- | | |
|--------------------------------------|------------------------|
| (i) stroking with a permanent magnet | (iii) by induction |
| (ii) using a direct current | |
| A. (i) only | C. (i) and (ii) only |
| B. (ii) and (iii) only | D. (i), (ii) and (iii) |

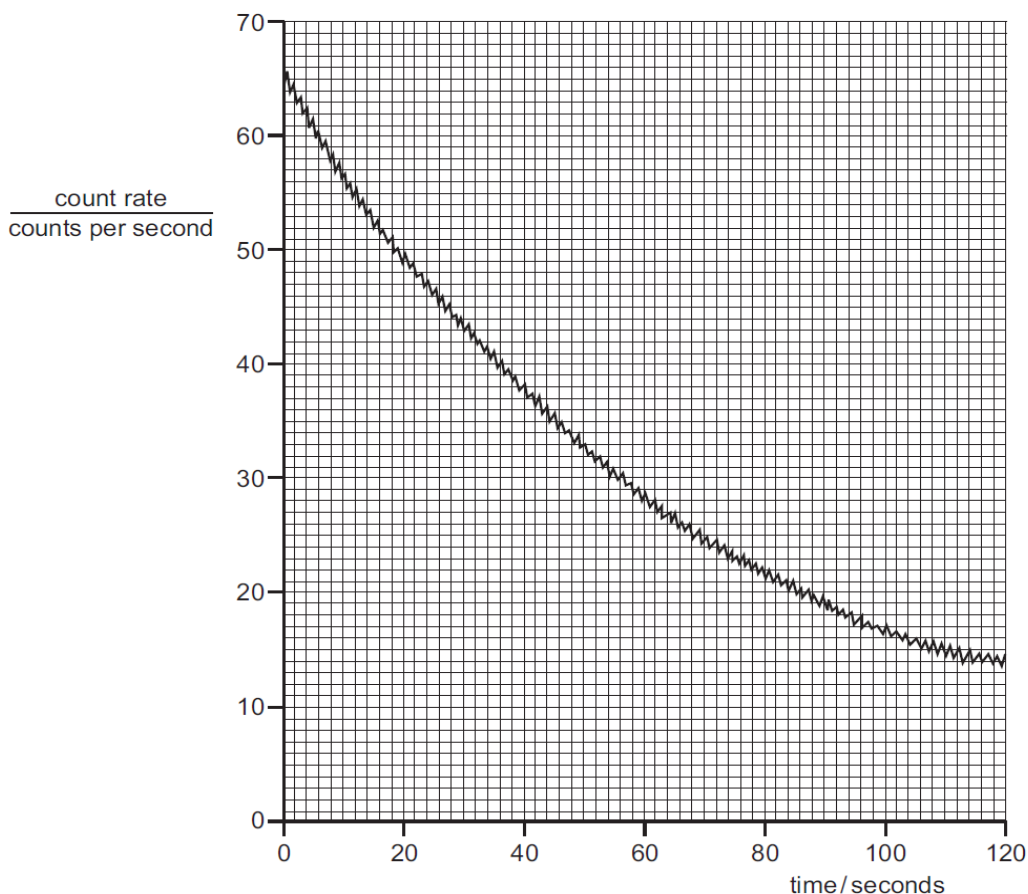
30. Ra decays with a half-life of 1 600 s.

Rn decays with a half-life of 52 s.

Po decays with a half-life of 9.1 s.

Pb decays with a half-life of 10.6 h.

The changing count rate for one of these radioactive nuclides is shown in the graph.



From the half-life shown by the graph, which was the decaying radioactive nuclide?

- A. Ra B. Rn C. Po D. Pb

31. A beam of white light is to be passed through a combination of 2 filters. Which combination would allow only red light?

- A. Blue and red filters B. Cyan and red filters
C. Yellow and magenta filters D. Cyan and magenta filters

32. An image of an object 5cm is formed by a converging lens. If the magnification is $\frac{1}{4}$, find the height of the object.

- A. 2.0cm B. 20cm C. 1.25cm D. 4.75cm

33. The coin C appears raised by 3cm when viewed from above. If the refractive index from air to water is $\frac{4}{3}$, what is the real depth of the water in the cylinder?

- A. 9cm B. 2.25cm C. 4cm D. 12cm

34. Find the quantity of heat needed to raise the temperature of 500g of a metal whose specific heat capacity is $400 \text{ J kg}^{-1} \text{ K}^{-1}$ from a temperature of 50°C to 100°C .

- A. 62.5J B. 40,000J C. 10,000J D. $1 \times 10^6 \text{ J}$

35. Which of the following can produce a cooling effect?

- (i) Compression of a gas (ii) Expansion of a gas
(iii) Evaporation of a liquid
A. (i) only B. (iii) only
C. (i) and (iii) only D. (i), (ii) and (iii)

36. What is the final volume if 400l of air is warmed from 100°C to 200°C at a constant pressure?

- A. 200l B. 320l C. 507l D. 800l

37. A dull black surface is a good

- (i) Absorber of heat energy (ii) Emitter of heat energy
(iii) Reflector of heat energy

- A. (i) only B. (i) and (ii) only
C. (ii) and (iii) only D. (i), (ii) and (iii)

38. Find the force required to give a mass of 500g an acceleration of $2 \times 10^{-2} \text{ms}^{-2}$.

- A. $1 \times 10^{-2} \text{N}$ B. $1 \times 10^1 \text{N}$ C. $1 \times 10^2 \text{N}$ D. $1 \times 10^4 \text{N}$

39. Which of the following properties changes when a body is moved from the earth to the moon?

- A. Mass B. Volume C. Weight D. Density

40. Which of the following is true about the compression stroke of a combustion engine?

- A. Piston descends, inlet valve close, exhaust valve open
B. Piston rises, inlet valve close, exhaust valve close
C. Piston descends, inlet valve open, exhaust valve close
D. Piston rises, inlet valve open, exhaust valve open

SECTION B: (40MARKS)

41. (a) State the law of floatation.

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(b) A cube of a material of side 0.1m floats in water with 25% of its volume above the surface of the water. Find the mass of the material of the cube.

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42. (a) 0.5cm^3 of oil was mixed with 199.5cm^2 of ethanol. 1cm^3 of solution when placed on the surface of clean water spreads into a patch of area 100cm^2 .

Calculate the thickness of the oil patch.

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(b) State any **two** assumptions made in (a) above.

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43. The spectrum of electromagnetic waves is divided into a number of regions such as radio waves, visible light and gamma radiation.

(a) State **three** distinct features of waves that are common to all regions of the electromagnetic spectrum.

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(b) A typical wavelength of visible light is $495 \times 10^{-9} \text{m}$. Calculate the number of wavelengths of this light in a wave of length 1.00m.

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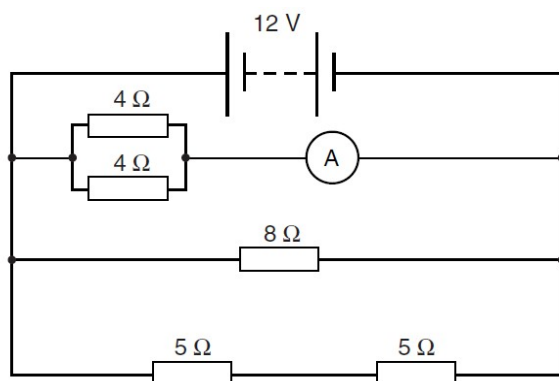
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44. (a) Define the term **potential difference**.

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(b) A 12 V battery connected to a number of resistors.



Calculate the current in the $8\ \Omega$ resistor.

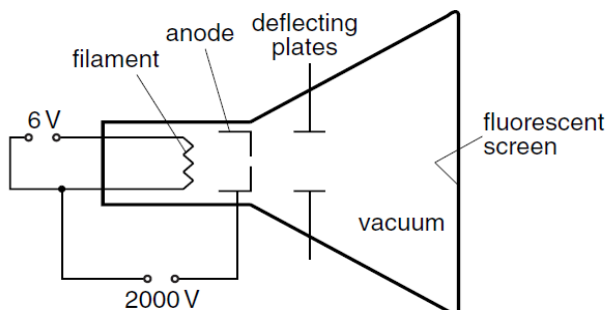
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45.(a)The figure below shows a simple version of an electron-beam tube. The filament is connected to a 6 V power supply and there is a potential difference of 2000 V between the filament and the anode. As the electron beam hits the fluorescent screen, a spot of light appears on the screen.



Explain why

(i) electrons are emitted from the filament,

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(ii) electrons accelerate after they leave the filament,

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(iii) a vacuum is needed in the tube.

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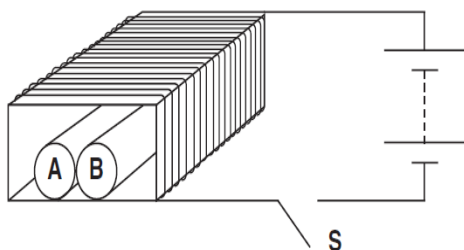
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(b). State any two uses of radiations.

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46. Two metal rods, **A** and **B**, of the same size are placed inside a solenoid, as shown below. The solenoid is connected to a battery through a switch **S**.



One rod is made of iron, the other of steel.

Explain the following observations that are made with this equipment.

(i) After **S** is closed, the metal rods roll away from each other.

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(ii) After some time **S** is then opened. The rods roll towards each other.

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47.(a) (i) Define *radius of curvature* as applied to a concave mirror.

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(ii) State two applications of concave mirrors.

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(b) Distinguish between a virtual and a real image.

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48.(a) Define the following term and state its **S.I** unit.

(i) Specific latent heat of fusion.

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(ii) Explain how evaporation takes place.

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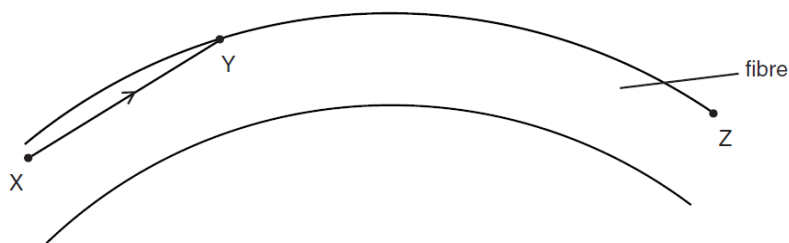
49.(a) Define critical angle.

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(b) State two conditions necessary for total internal reflection to occur.

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(c). The figure below shows an optical fibre. XY is a ray of light passing along the fibre.



(i) Continue the ray XY until it passes Z.

(ii) Explain why the ray does **not** leave the fibre at Y.

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50. (a) Define **pressure** and state its **S.I** unit.

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(ii) Explain why cooking may be impossible at a mountain top.

..... (b) State two factors on which the pressure of a liquid depends.

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****END ****