

1. State two properties of a magnet

2mks

- Magnetic poles
- Directional property

2. Distinguish between magnetic fields and magnetic line of force

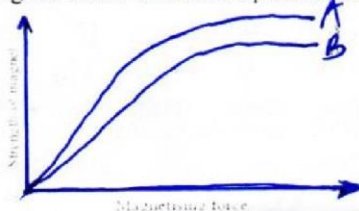
2mks

Magnetic field is the region/space where magnetic is felt while magnetic line of force is the path along which a free north pole would move.

3. Give three properties of magnetic field lines 3mks

- Originate from North pole and ends in the South pole
- they repel each other hence never meet.
- they are close together where the field is strongest, far apart where weak and far where uniform

4. The figure below shows the process of magnetizing magnetic materials A and B.



a) Which of the two materials is easier to magnetize?

1mk

A.

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b) Which of the two materials forms a stronger magnet?

1mk

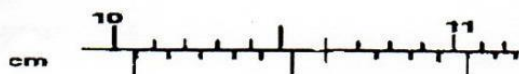
B.

c) Differentiate between the two materials and give example in each case.

3mks

A is a soft magnetic material and it is easy to magnetise i.e soft iron while B is a hard magnetic material and it is hard to magnetise and does not lose magnetism easily i.e steel.

5. a. The figure below shows a vernier calipers scale.



If the instrument above has a +0.03 zero error, find the actual reading of the instrument

3mks

$$\begin{array}{l} \text{Main scale: } 10.00 \text{ cm} \\ \text{Vernier scale: } 6 \times 0.01 \\ = 0.06 \end{array} \quad \begin{array}{r} 10.00 \\ + 0.06 \\ \hline 10.06 \text{ cm} \\ - 0.03 \\ \hline 10.03 \end{array} = 10.03 \text{ cm}$$

b. If an oil drop of diameter 0.8mm spread on the surface of water to form an oil patch of diameter 0.2m, estimate the length of the oil molecule and express our answer in two significant figures

4mks

$$\begin{array}{l} \frac{4}{3}\pi r^3 = \frac{4}{3}\pi \times \left(\frac{0.8}{2}\right)^3 \\ = \frac{4}{3}\pi \times (0.0008)^3 \\ = 2.146 \times 10^{-9} \text{ m}^3 \end{array} \quad \begin{array}{l} A_p = \pi r^2 \\ = \pi \times (0.01)^2 \\ = 0.03143 \text{ m}^2 \end{array} \quad \begin{array}{l} t = \frac{V}{A} \\ = \frac{2.146 \times 10^{-9}}{0.03143} \\ = 8.5 \times 10^{-9} \text{ m} \end{array}$$

c. Give three assumption when carrying out the above experiment

3mks

- The oil drop is spherical.
- The oil patch is cylindrical.
- The oil patch is one molecule thick.
- The oil drop does not evaporate.

6. a. What are the two factors that affects moments of force

2mks

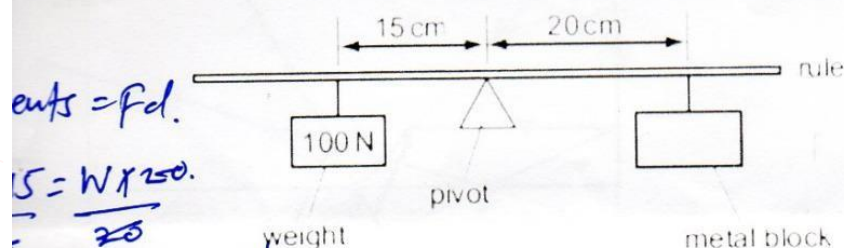
- Distance from the force from the pivot.
- The magnitude of force.

b. State the principle of moments

2mks

For a system in equilibrium, the sum of clockwise moments is equal to the sum of anticlockwise moments.

c. A uniform meter rule pivoted at its center is balanced by a force 100N and a metal box as shown. Find the weight of the metal box. 4mks



ents = Fd .

$15 = \frac{W \times 20}{20}$

$15 \text{ N} \rightarrow \text{weight}$

d. State two applications of moments of force 2mks

- opening of taps. - pedals
- steering wheel.

7. a. State and explain two states of equilibrium 4mks

Stable $\rightarrow$ a body returns to its original position when displaced slightly.
 unstable $\rightarrow$ a body does not return to its original position when displaced slightly but occupies a new position.

b. Explain two factors affecting stability of objects 4mks

- Base area $\rightarrow$ wider base more stable and vice versa.
- position of C.O.G $\rightarrow$ higher position of C.O.G less stable and lower C.O.G more stable.

8. a. Define the following terms 4mks

i. Centre of curvature

Centre of the sphere of w/c the mirror is part of.

ii. Principal focus

This is a point on the principal axis to w/c all rays close and parallel to the principal axis converge for concave or appears to diverge from for convex mirrors after reflection.

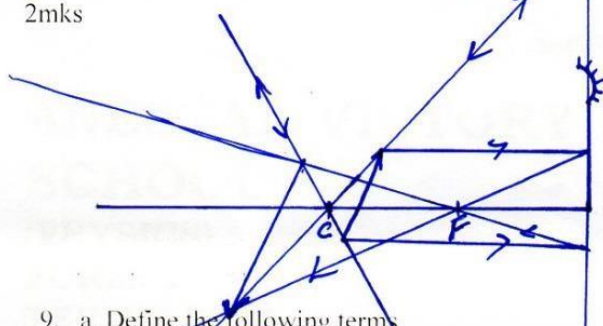
iii. Focal length

This is the distance from the pole 'P' to the principal focus f.

iv. Focal plane

This is the plane perpendicular to the principal axis and passes through the principal focus.

b. The figure below shows an object O in front of a concave mirror. On the diagram, complete the rays to show the location of the image
2mks



9. a. Define the following terms

2mks

i. Stiffness

This is the resistance a material offers to a force that tends to change its shape or size.

ii. Elasticity

This is the ability of a material to recover its original and size after the force causing deformation is removed

b. State Hooks Law

2mks

"For a helical spring or other elastic material, the extension is directly proportional to the stretching force provided that the elastic limit is not exceeded.

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