PHYSICS
FORM TWO
MID-TERM EXAM
TERM 2 - 2024

MARKING SCHEME.

1. Define the following terms as used in reflection. (3mks)
   a) Center of curvature (c)
   Center of sphere of which the mirror is part of.

   b) Focal plane.
   - ***Is a plane perpendicular to the principal axis and passes through the principal focus.***

   c) Focal length (f)
   - ***Is the distance from the pole of the mirror to its principal focus.***

2. An object is placed (a) 18cm (b) 6cm in front of a concave mirror of focal length 12cm. determine the position and nature of the image formed in each case. (4mks)

   Solution:
   a) u= +18cm
   f= +12cm.
   using
   $^1/_v = {}^1/_u + {}^1/_f$
   $\frac{1}{V} + \frac{1}{(+18)} = \frac{1}{(+12)}$
   $\frac{1}{V} + \frac{1}{12} = \frac{1}{18}$
   $= \frac{1}{V} - \frac{1}{36}$
   $V = 36$
   The image formed 36 cm from the mirror, V is positive so image is real.

   b) u= +6
   substituting in the formula
   $\frac{1}{V} + \frac{1}{+16} = \frac{1}{(+12)}$
   $\frac{1}{V} = \frac{1}{12} - \frac{1}{6}$
   $= \frac{1}{V} - -\frac{1}{12}$
   $V = 12$
   The image formed is 12cm from mirror, V is negative hence image is virtual.

3. State and explain one advantage and one disadvantage of using a convex mirror as a driving mirror. (2mks)

Advantage:

- ***Provide a wide field so that overtaking traffic can be easily seen.***
- ***Form an upright image regardless of object distance.***

Advantage:

- ***Forms a diminished image giving the impression that the vehicles behind are farther away than they actually are.***

4. State the Maxwell's Right-hand grip rule for a call carrying current. (2mks)
   If a coil carrying current is held in the right hand such that the fingers encircles the loops while pointing in the direction of the current flow, the thumb points in the direction of the north pole.

5. State the factors that affect the strength of an electromagnet. (3mks)
   i) Size of current in the solenoid.
   ii) The number of turns of wire in the solenoid.
   iii) The shape of the core.
   iv) The length of the solenoid

6. Draw the magnetic field pattern due to two isolated straight conductors carrying a current. (2mks)

7. State three applications of an electromagnet. (3mks)
   i. Electric bell
   ii. Telephone receiver.
   iii. Electromagnet relay
   iv. Moving coil loudspeaker.
   v. Moving coil meter.
   vi. Circuit breaker.

8. (a) State the Hooke's law. (2mks)
   For a helical spring, or elastic material the extension is directly proportional to the stretching force, provided the elastic limit is not exceeded.

   (b) A metal cube suspended freely from the end of a spring causes it to stretch by 5.0cm. A 500g mass suspended from the same spring stretches by 2.0 if the elastic limit is not exceeded. Find the weight of the metal cube. (2mks)
   F = Ke

$K = {}^{F}/_{e}$

But $F = mg$

$$K = \frac{0.5 \times 10}{2 \times 10^{-2}}$$

Weight of cube= 250 X 5 X 10^{-2}

= 12.5N

(c) By what length will the spring stretch if a mass of 1.5kg is attached to its end. (2mks)

Force = 1.5 X 10

= 15

From F = Ko

$$e = \frac{F}{k}$$

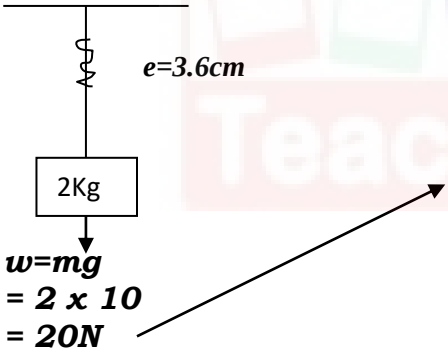
$$\frac{15}{250}$$

=0.06 or 6.0cm

9. A single spring extends by 3.6cm when a supporting a load of 2.0kg. Assuming that all the springs are identical and of negligible weight, what is the extension in the arrangement shown below. (4mks)

Ans

1 spring = 3.6cm



Spring constant = ?

F = Ke

$$K = \frac{F}{e}$$

$$= \frac{20N}{3.6cm}$$

K = 5.56N/cm.

w=mg

= 2 x 10

= 20N

3 springs

3→ (5.56 x 3)

KT = 16.67N/cm

$$F = Ke \rightarrow e = \frac{60}{16.67}$$

= 3.6cm

2 springs

(5.5g x2) = 11.12 N/cm

$$e = \frac{60}{11.12}$$

5.40 cm

Total extension = 5.40 + 3.6

= 9.0cm

10. Explain the following characteristics used the describe materials as used in Hooke's law. (4mks)

a. Ductility – ***Quality of materials which leads to permanent change of size and shape.***

b. Elasticity – ***Ability of a material to recover its original shape ad size after force causing deformation is removed.***

11. State two advantages of an electromagnet as compared to a permanent magnet. (2mks)

- ***Can easily be magnetized and demagnetized as compared to permanent magnet.***
- ***Has high concentration of magnetism for a short time.***

12. (a) Name the three states of equilibrium. (3mks)

i. stable
ii. unstable
iii. neutral.

(b) State two conditions for a body to be in a state of equilibrium. (2mks)

i. Centre of gravity must be as low as possible.
ii. The area of base must be as large as possible.
iii. The vertical line drawn from the centre of gravity falls within its base.

13. In an experiment to estimate the size of a molecule of olive oil, a drop of oil diameter 0.5mm was placed on clean water surface. The oil spread into a patch of diameter 0.2m; estimate the size of a molecule of olive oil. Write your answer in standard form. (4mks)

Volume of drop
= volume of patch

$$^4/_3\,\pi r^3 \times \pi = \pi R^2 h$$

$$^4/_3 \times \pi \times (0.5)^3 = {}^{22}/_7 \times 200^2 \times h$$

$$h = \frac{^4/_3 \times \pi \times (0.5)^3}{\pi \times (200^2}$$

$$h = \frac{0.125}{40.000}$$

$$= 0.000003125$$

$$= 3.125 \times 10^{-6} mm$$

14. Express the following in grams giving the answer in standard form.

a) 25 kg. (2mks)

1kg – 1000g

$25 - 25 \times 1000 = 25000g$

$2.5 \times 10^4 g$

b) 3.0 tonnes. (2mks)

1000kg – 1 tonne
3 x 1000
3000kg
3000 x 1000
= 3.0 x 10^6g.

15. State three uses of magnets. (3mks)

- ***Loudspeaker / microphones.***
- ***In medicine.***
- ***Sorting / separating.***
- ***Magnetic screw drivers.***