STANDARD HIGH SCHOOL ZZANA

'O' LEVEL PHYSICS QUESTIONS 2020

MECHANICS AND PROPERTIES OF MATTER

1. (a) (i) Define velocity.

(ii) Distinguish between a vector quantity and a scalar.

(b) A body moves 12 m due East in 3 seconds then 5 m due south in 1 second. Calculate the:

(i) total distance
(ii) total displacement
(iii) average speed
(iv) average velocity for the whole journey.

(c) Describe an experiment to determine acceleration due to gravity using a simple pendulum.

(d) (i) State the principle of conservation of momentum.

(ii) Explain why drops of water make a hole on the ground after some time.

(e) Two bodies of mass 200 g and 100 g travel towards each other on a horizontal ground with velocities of 20 ms^{-1} and 25 ms^{-1} respectively and join to form one body on collision.

(i) What type of collision is this?

(ii) What is the common velocity immediately after collision?

(iii) Which direction do they move after collision?

2. (a) (i) Define pressure.

(ii)

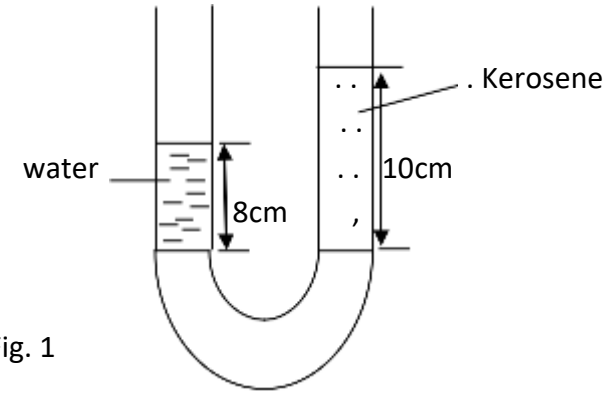

Fig. 1

An open U-tube contains columns of water and kerosene over mercury as shown in Fig 1. If the density of water is 1,000 kgm^{-3} and the acceleration due to gravity is 10 ms^{-2}, calculate the density of kerosene.

(b) (i) State two factors on which the pressure of a liquid depends at a given location.

(ii) Explain why cooking at a high altitude takes a longer time than at a lower altitude.

(c) (i) Describe an experiment to demonstrate diffusion in liquids.

(ii) Give two factors which affect diffusion in liquids.

(d) Explain why it is easy to suck a liquid from a bottle using a drinking straw.

3. (a) (i) State the principle of moments.

(ii) Describe an experiment to determine the weight of a beam using the principle of moments.

(b)

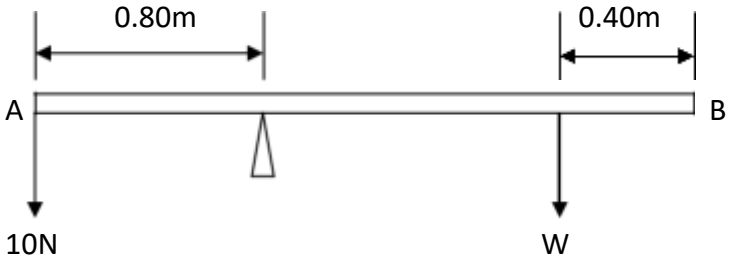

Fig. 2

The diagram in Fig. 2 shows a uniform beam AB of weight 5N and length 2.00m in equilibrium on a knife edge. Determine the value of W.

(c) Define the following terms as applied to machines:

(i) Velocity ratio.

(ii) Efficiency.

(d) A solid body rests with its flat surface on horizontal ground. State two factors that determine the stability of the body.

(e) A pulley system of velocity ratio 5 is used to raise a load of 600 N .

(i) Draw a sketch diagram to show the arrangement of the pulley system when in use.

(ii) If the efficiency of the system is 90%, determine the load applied.

(ii) Give two possible reasons why the efficiency is not 100%.

HEAT

4. (a) (i) Distinguish between heat capacity and specific heat capacity.

(ii) A glass of mass 350 g contains 400g of water at 25^0C. 50 g of ice dropped into the glass and stirred until it all melts. Calculate the final temperature of the water.

[Specific heat capacity of glass = 670 $Jkg^{-1}K^{-1}$

Specific heat capacity of water = 4,200 $Jkg^{-1}K^{-1}$

Specific latent heat of ice $=3.36 \times 10^5$ Jkg^{-1}]

(b) Explain why a person feels cold when he pours petrol on his hand.

(c)

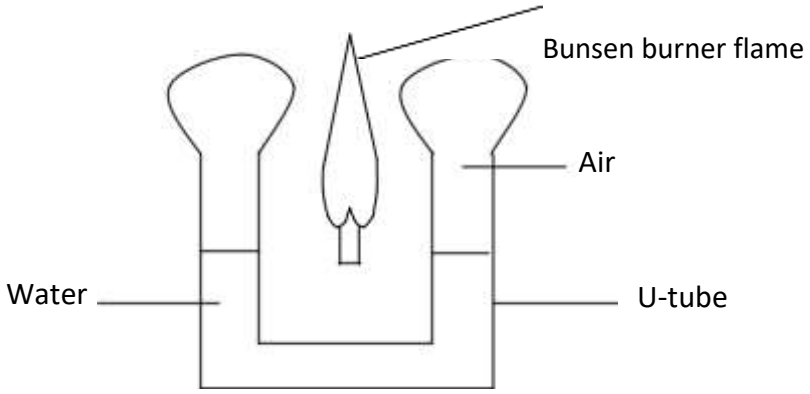

Fig. 3

The diagram in Fig. 3 shows a source of heat placed equidistant from two identical bulbs A and B which are connected to a U-tube containing water. Bulb A is blackened while B is left clear. Explain what would be observed after a few minutes.

(d) Describe how a sea breeze is formed.

5. (a) (i) State Boyle's law.

(ii) With the aid of a labeled diagram, describe an experiment to demonstrate Boyle's law.

(b) A certain mass of dry air has a volume of 100 cm^3 when its temperature is 27 ^oC and its pressure is 460 mmHg. What will be its volume when the temperature is raised to 87 ^oC and pressure raised to 650 mmHg.

(c) Explain why the volume of a fixed mass of a gas decreases when the gas is compressed under constant temperature.

(d) What is meant by absolute zero?

WAVES

6. (a) State the laws of reflection of light.

(b) With the aid of a diagram, illustrate how shadows are formed when an opaque object is placed between an extended source of light and a screen.

(c) Define the following terms as applied to curved mirrors:

(i) Pole (ii) Centre of curvature (iii) Focal plane

(d) (i) Describe, with the aid of a diagram, how a concave mirror is used to view small particles.

(ii) Give two reasons why convex mirrors are used in vehicles.

(e) Give **two** advantages of a plane mirror as a driving mirror.

7. (a) With the aid of a diagram, describe how the focal length of a converging lens can be determined using a torch bulb and a plane mirror.

(b) An object of height 3 cm high is placed 30 cm from a convex mirror of focal length 20 cm. By using graphical construction, determine:

(i) the position of the image formed.

(ii) the nature of the image.

(c) (i) What is a primary colour?

(ii) Explain why petals of some flowers appear red.

(d) (i) Define total internal reflection.

(ii) Give two applications of total internal reflection.

8. (a) (i) Describe how the speed of waves in a ripple tank can be decreased.

(ii) Explain the effect of decreasing the speed of the wave in (a) (i) on frequency.

(b) With the aid of a diagram, explain the effect of size of a gap on diffraction of waves.

(c) (i) Explain why sound is louder at night than during the day.

(ii) An echo – sounding equipment on a ship receives sound pulses reflected from the sea bed 0.02 s after they were sent out from it. If the speed of sound in water is 1,500 ms^{-1}, calculate the depth of the water under the ship.

(d) Explain why reflection of sound is more pronounced on a hard surface than on a soft one.

ELECTRICITY

9. (a) Define electric current.

(b) Explain the difference between a voltmeter and an ammeter in terms of their:

(i) construction (ii) use.

(c) State three physical properties that affect the resistance of a solid conductor

(d) With the aid of a circuit diagram, describe an experiment to show the variation of potential difference against current through an Ohmic conductor.

(e)

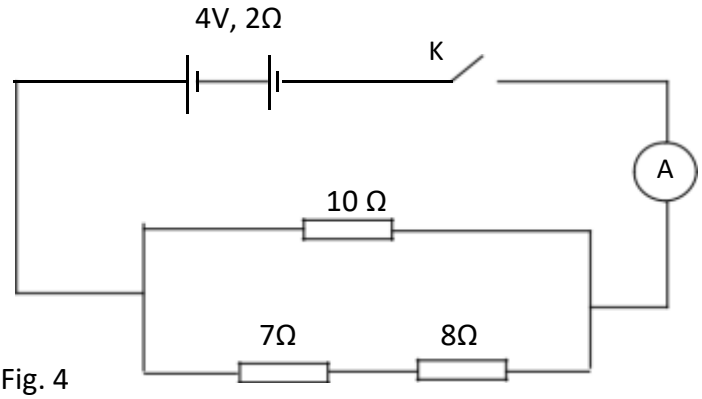

Fig. 4

The circuit in Fig. 4 shows a battery of e.m.f. 4V and internal resistance 2 Ω connected to resistors of resistance 10 Ω, 7 Ω and 8 Ω. Find the ammeter reading when the switch K is closed.

10. (a) State the law of charges.

(b) Describe how two identical metal balls can be charged positively and simultaneously by induction.

(c) Describe how the distribution of charge inside a hollow conductor can be investigated.

(d) Explain what happens when a negatively charged rod is brought near the cap of an uncharged gold leaf electroscope and then slowly taken away.

MODERN

11. (a) Describe a simple model of the atom.

(b) Define the following: (i) atomic number (ii) isotopes.

(c) State **two** differences between alpha particles and beta particles.

(d) (i) Distinguish between nuclear fission and nuclear fusion.

(ii) Give an example where each one occurs.

(e) The half life of a radioactive substance is 24 days. Calculate the mass of the substance that will have decayed after 72 days if the original mass is 64 g.

(f) Give **two** industrial uses of radioactivity.

MAGNETISM

12. (a) Distinguish between ferro-magnetic materials and non-magnetic materials. Give one example of each.

(b) You are provided with a piece of steel bar. Describe how you would determine whether it is magnetized.

(c) With the aid of a diagram, describe how a device like a watch can be protected from a magnetic field.

(d) Use the domain theory to explain the process of magnetization.

(e) Give **two** devices where permanent magnets are used.

END