MAKUENI COUNTY CLUSTER PREPARATORY EXAMINATION 2016

232/1
PHYSICS
Paper 1
JULY/ AUGUST 2016
(THEORY)
Time: 2 Hours

SECTION (25 MARKS)
**Answer ALL questions in this section**

1. A micrometer screw gauge has a zero error of -0.02mm. It is used to measure the diameter of a wire. If the actual diameter of the wire is 0.28mm. Draw the micrometer screw gauge showing the diameter of the wire.   (2 marks)

2. Figure 1 shows two identical hollow spheres. Sphere A is completely filled with the liquid while B is partially filled with an identical liquid.

A   B
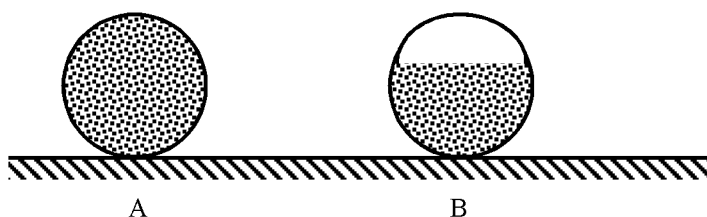
Figure 1
When the two spheres are rolled on a horizontal surface, it is observed that the sphere B stops earlier than sphere A. Explain this observation.   (2 marks)

3. The spiral springs shown in the figure 2 below are identical. Each spring has a constant K = 300N/m.
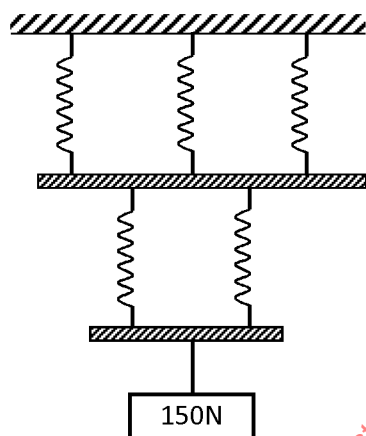
150N

Figure 2
Determine the extension caused by the 150N weight (Ignore weight of springs and connecting rods)   (3 marks)

4. A uniform 120m metal rod is pivoted near one of its ends and kept in equilibrium by a spring balance as shown in figure 3.

26cm

12cm

Figure 3
The reading indicated by the spring balance is 2.0N. Work out the mass of the metal rod. (g = 10N/kg)   (3 marks)

5. A mass of 8kg is whirled round in a vertical circle using a rope of length 80cm if it makes 2.5 cycles in 1 second, calculate the maximum tension the rope experiences.   (3 marks)

6. Air is trapped in a thin capillary tube by a thread of mercury 5cm long as shown in figure 4.
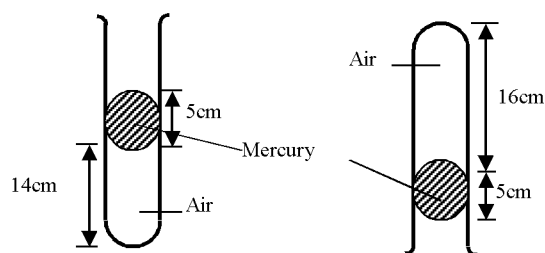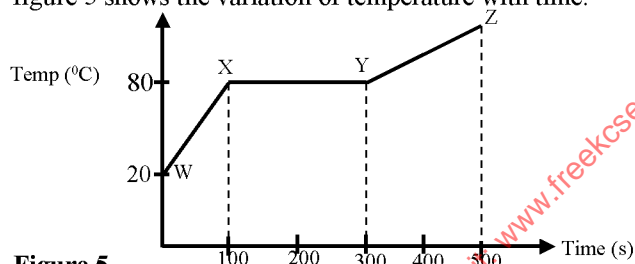
Figure 4

Use the information in figure 6 to calculate the value of the value of the atmospheric pressure in mmHg   (3 marks)

7. A trolley is moving at uniform speed along a track. A piece of plasticine is dropped on the trolley and sticks on it. Explain why the trolley slows down.   (1 mark)

8. State a reason why more energy is required to change ice from 0^0C to water at 1^0C, than to change equal mass of water from 0^0C to 0^0C.   (1 mark)

9. State a reason why an air bubble increases in volume as it rises up the surface in a boiler.   (1 mark)

10. A car of mass 800kg is initially moving at 25m/s, calculate the force needed to bring the car to rest over a distance of 20m.   (2 marks)

11. An electric kettle with shiny outer surface is more efficient than one with a dull outer surface, give a reason for this.   (1 mark)

12. A pipe of radius 3mm is connected to another pipe of radius 9mm. If water flows in the water pipe at a speed of $2ms^{-1}$, what is the speed in the narrower pipe   (2 marks)

13. A force of 20N is used to stretch a spring through 5cm. Calculate the elastic potential energy stored in the spring.   (2 marks)

SECTION B. (55 MARKS)
Answer ALL questions in this section

14. (a) Distinguish between boiling and evaporation.   (2 marks)

    (b) A solid of mass 1kg was heated uniformly by a 100W heating element until it melts. The graph in figure 5 shows the variation of temperature with time.

    Figure 5

    (i) Explain what is happening in the regions
    WX:
    XY:
    (ii) Calculate the specific heat capacity of the solid.   (3 marks)
    (iii) Calculate the specific latent heat of fusion of the solid   (2 marks)

    (c) A substance of mass 2kg and specific heat capacity $400Jkg^{-1}k^{-1}$ initially at 80^0C is immersed in water at 19^0C. If the final temperature of the mixture is 20^0C. Calculate the mass of water. (Specific heat capacity of water = $4200Jkg^{-1}k^{-1}$)   (3 marks)

15. (a) State the physical quantity represented by the gradient of a displacement – time graph   (1 mark)

    (b) Figure 6 shows the displacement – time graph of the motion of a particle
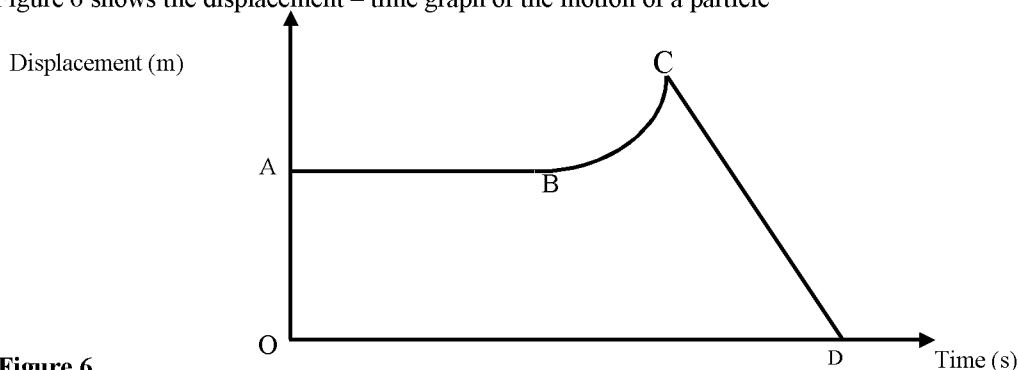
    Figure 6

   State the nature of the motion of the particle between?   (3 marks)
    (i) AB
    (ii) BC
    (iii CD
    (c) A car decelerates uniformly from a velocity of 20m/s to rest in 4 seconds. It takes 4 seconds to reverse with uniform

acceleration to its original starting point.

(i) Sketch a velocity time graph for the motion of the car. (3 marks)

(ii) Use your sketch in c (i) to determine the total displacement of the car. (3 marks)

(d) A ball slides off a horizontal table 4m high with a velocity of 12m/s, find;

(i) the time it takes to hit the floor. (g = 10ms-2) (2 marks)

(ii) the range (2 marks)

16. (a) State two factors that reduce the stability of a vehicle while going round a banked bend. (2 marks)

(b) Three insoluble powders A, B and C of densities d_A, d_B and d_C, such that $d_A > d_B > d_C$, are mixed and put into a container. The container is then whirled in a horizontal circle as shown in figure 7.
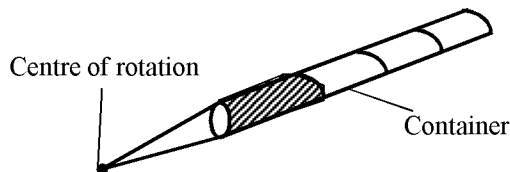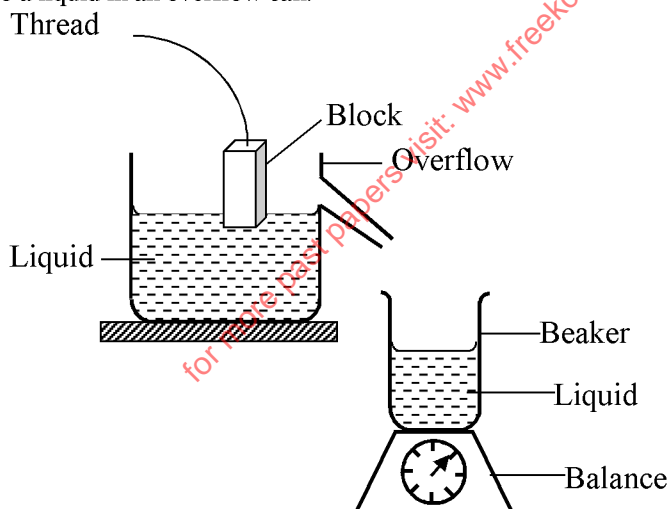

Figure 7

(i) Label on figure 7, the positions of the powders after some time. (1 mark)

(ii) Give a reason for your answer in b (i) (2 marks)

(c) Figure 8 shows two masses 0.1kg and 2kg connected by a string through a hole on a smooth horizontal surface.
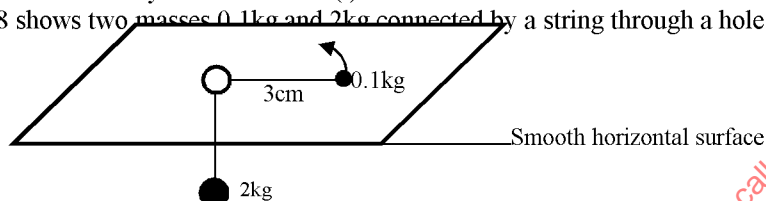
Figure 8

The 0.1kg rotates in a horizontal circle of radius 3cm. Calculate the angular velocity of the 0.1kg mass, when the system is in equilibrium. (3 marks)

(d) A bicycle wheel makes 300 revolutions per minute. Calculate the angular velocity of the wheel. (3 marks)

17. (a) State two conditions for a body to float on a fluid. (2 marks)

(b) Figure 9 shows a block with a graduated side and dimensions 4cm by 16cm, just about to be lowered into a liquid in an overflow can.
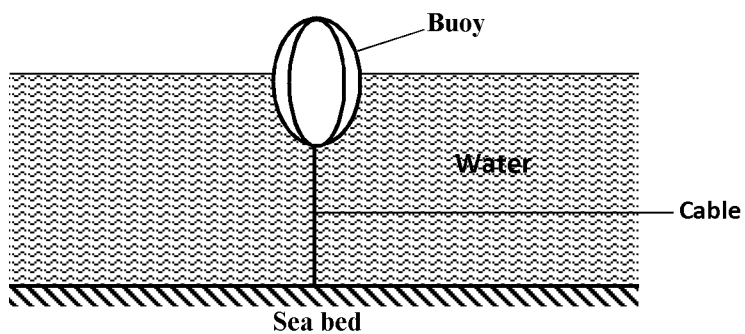

Figure 9

During an experiment with this set-up, the following was recorded:

- The block floated with $\frac{3}{4}$ of it submerged.

- Initial reading of balance = 0g

- Final reading of balance = 154g

Use the information to determine the density of

(i) the block (3 marks)

(ii) the liquid (3 marks)

(c) Figure 10 shows a buoy of capacity 40 litres and mass 10kg. It is held in position in sea water of density 1.04g/cm3 by a light cable fixed to the bottom so that ¾ of its volume is below the water surface.

Figure.10

Determine the tension in the cable. (3 marks)

18. Figure 11 shows a load of 50N being raised by pulling it along an inclined plane of length 2.0m.

2.0m

h = 0.5m
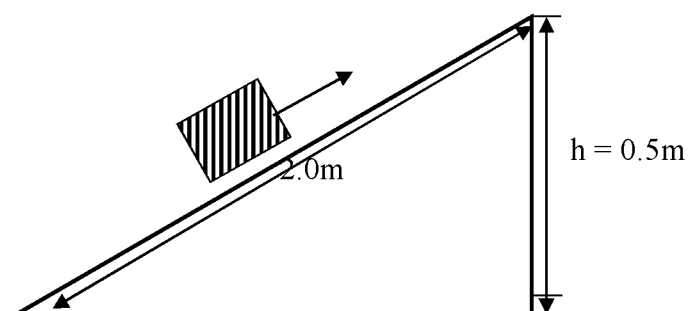
Figure 11

Determine

i. The work done by the 22N force (2 marks)
ii. The work done against the load (2 marks)
iii. The efficiency of the system (3 marks)