232/1

PHYSICS
PAPER 1
TIME: 2 HRS

INSTRUCTION TO CANDIDATES:

1. Write your name and Admission number in the spaces provided.

2. Answer all the questions in the spaces provided.

3. Mathematical tables and electronic calculators may be used.

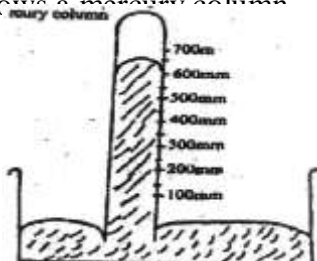4. All workings must be clearly shown where necessary.

FOR EXAMINERS USE ONLY:

SECTION	QUESTIONS	MAXIMUM SCORE	CANDIDATES SCORE
A	1 – 13	25	
B	14	14	
	15	08	
	16	11	
	17	12	
	18	10	
TOTAL		**80**	

SECTION A: (25 MARKS)
Answer all question

1. The figure below shows a mercury column.

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Given that the height of the mercury column is calibrated in mm, state the reading of the column height. (1 mk)

2. Two springs of negligible weights and of constants K_1=50N/M and K_2=100N/M respectively are connected end to end and suspended from a fixed point as shown in the diagram.

A 200g mass was hung on the lower end.
Calculate the spring constant of the combination. (2 mks)

3. A nurse applies a force 30N to syringe. Given that the cross-sectional area of the tip of the needle is $1.0 \times 10^{-7} m^2$, calculate the pressure produced at the tip of the needle. (2 mks)

4. Define diffusion. (1 mk)
5. The pressure exerted by a gas of volume $0.024m^3$ at room temperature is 4.2x105 pa. Determine the pressure at which the volume of the gas reduces to 0.018m3 at the same temperature. (3 mks)

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6. State principle of moments. (1 mk)

7. Droplets of water sprinkled on greasy glass plate form spherical shapes. Explain. (1 mk)

8. A boy throws a ball of mass 100g vertically upwards to a height of 5m. Calculate the kinetic energy with which the ball leaves the hand. (2 mks)
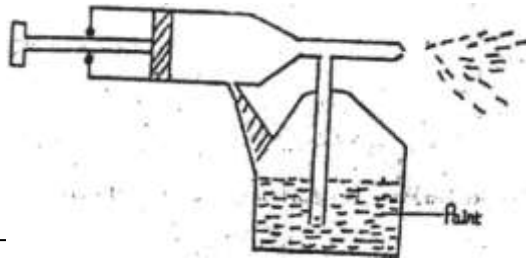
9. Give a reason why a house constructed with concrete beams reinforced with steel does not crack when subjected to temperature changes. (1 mk)

10. The figure below shows two balloons inflated with air at room temperature.
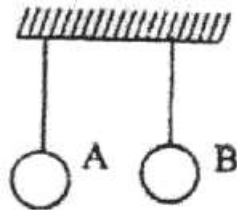
Balloon A is painted black and balloon B is painted white. A little amount of ice-cold water is poured on each balloon. State and explain the observation made. (2 mks)

11. The diagram shows a paint spray gun.

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Explain how the gun works. (3 mks)

12. A drop of oil of volume $5.0 \times 10^{-3} cm^3$ forms a patch of diameter 35cm on a water surface. Calculate the diameter of a molecule of oil. (3 mks)

13. A uniform metre rule pivoted at the 70cm mark balances when a mass of 100g is hung at the 90cm mark. Calculate the mass of metre rule. (3 mks)

SECTION B: (55 MARKS)
14. (a) Differentiate between distance and displacement. (1 mk)

(b) A car starts from rest and accelerates uniformly to 15m/s in 5 seconds. It then continues at that speed for 40 seconds and then decelerates uniformly to a stop in 3 seconds.
   (i) Sketch the velocity – time graph for the motion. (3 mks)

(ii) Determine the distance covered by the car. (2 mks)

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(iii)Find the average speed of the car during the journey. (2 mks)

(c) A trolley of mass 1.4kg moving at 0.8ms^{-1} on a frictionless horizontal surface was acted on by a force of 0.7N. If the resulting speed of the trolley was 1.7ms^{-1}, determine
  (i) The change of momentum of the trolley. (2 mks)

  (ii) The time interval the force acted on the trolley. (2 mks)

  (iii)The acceleration of the trolley. (2 mks)

15. The figure shows a mass of 50kg pulled along an inclined planed by a force of 300N parallel to the inclined plane. The mass moves through a distance of 30m along the plane and rises a vertical height of 12m.
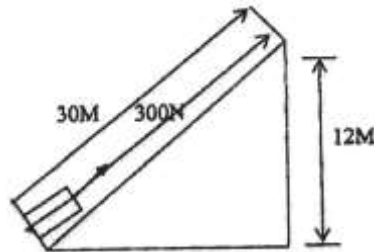
 (a) Determine:
    (i) The work done on the load. (2 mks)

    (ii) The work done by the force. (2 mks)

    (iii)Efficiency of the inclined plane. (2 mks)

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(b) Give two ways by which the efficiency of the inclined plane can be improved. (2 mks)

16. (a) Write the expression for the equation of continuity and define each component of the equation. (2 mks)

(b) The figure below shows a Bunsen burner in operation with the air hole open.
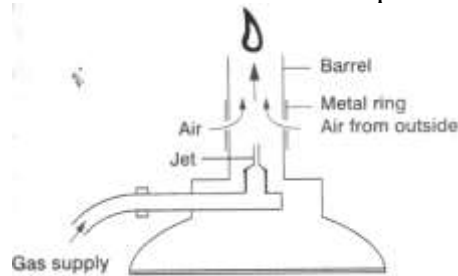
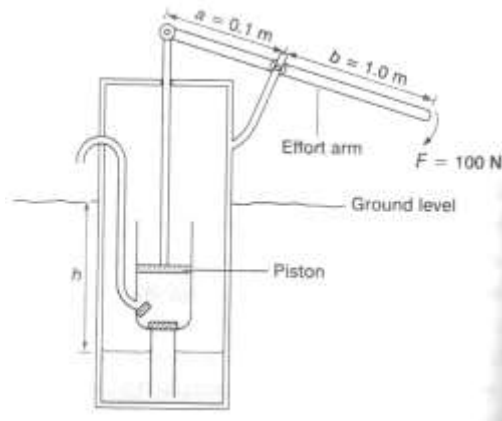(i) Explain how the air is drawn into the barrel when the gas supply is opened. (2 mks)

(ii) What is the purpose of the metal ring? (2 mks)

(c) A pipeline is 15cm in diameter at one point and 7.6cm in diameter at another point. If the speed of water in the wider section is 1.2m s^{-1}, determine:
(i) The speed of water in the narrow section. (3 mks)

(ii) The rate of discharge. (2 mks)

17. (a) The diagram below shows a water pump designed to raise water from a well.

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Take a=0.1m, b=1.0m, F=100 N, the diameter of the piston = 5cm, g=10 N kg^{-1} and the density of water = 1.0 x 10^3 kg m^{-3}.

(i) Determine the maximum force on the piston when a force of 100 N is applied at the end of the effort arm during the downward stroke. (3 mks)

(ii) Calculate the maximum pressure exerted by the piston on the water. (4 mks)

(iii) Determine the maximum height to which the water can be raised. (2 mks)

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(b) The height of a mercury barometer at a place is found to be 58 cm. what is the atmospheric pressure at the place? (Density of mercury is 1.36×10^4 kg m^{-3}.)   (3 mks)

18. (a) In an experiment to demonstrate Brownian motion, smoke was put in an air cell and observed under a microscope. Smoke particles were observed to move randomly in the cell.
    (i) Explain the observation.   (1 mk)

    (ii) Give a reason for using small particles such as those of smoke in this experiment. (1 mk)

    (iii) What would the most likely observation be if the temperature in the smoke cell was raised?   (1 mk)

(b) An oil drop of average diameter 0.7mm spreads out into a circular patch of diameter 75cm on the surface of water in a trough.
    (i) Calculate the average thickness of a molecule of the oil.   (4 mks)

    (ii) State two assumptions made in (b) (i) above when calculating the thickness of the oil molecule.   (2 mks)

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