

KCB S.5 PHYSICS P510/1 TEST

TIME: 1 HOUR

22/OCT/2014

- (i) In numerical work, use $g = 9.81 \text{ ms}^{-2}$. (ii) Attempt **all** the questions.
1. (a) (i) Define **moment of a force** and state the **principle of moments**. (2)
- (ii) A wheel of radius 0.84 m is pivoted at its centre. A tangential force of 80 N acts on the wheel so that the wheel rotates with uniform velocity. Find the work done by the force to turn the wheel through 18 revolutions. (4)
- (b) The engine of a 5 tonne lorry can develop 30 kW and its maximum speed on level road is 90 kmh^{-1} . Assuming that the frictional resistance is constant, calculate the greatest speed at which the lorry can climb a hill of 1 in 25. (4)
- (c) Define the terms **angular velocity** and **centripetal acceleration**. (2)
- (d) The period of oscillation of a conical pendulum is 2.0 seconds. If the string makes an angle of 60° to the vertical at the point of suspension, calculate the:
- (i) vertical height of the point of suspension above the circle. (3)
- (ii) velocity of the mass attached to the string. (1)
- (e) Using the molecular theory, describe the **laws of friction**. (3)
2. (a) Describe briefly how heat transfer by **conduction** takes place. (3)
- (b) (i) State **Stefan's law**. (1)
- (ii) The element of a 1.0 kW electric heater is 30.0 cm long and 1.0 cm in diameter. If the temperature of the surroundings is 20°C , estimate the working temperature of the element. (3)
- (Stefan's constant, $\sigma = 5.7 \times 10^{-8} \text{ W m}^{-2} \text{ K}^{-4}$)
- (c) (i) State **Dalton's law of partial pressures** and **Avogadro's hypothesis**. (2)
- (ii) Two containers A and B of volumes $3 \times 10^3 \text{ cm}^3$ and $6 \times 10^3 \text{ cm}^3$ respectively contain helium gas at a pressure of $1.0 \times 10^5 \text{ Pa}$ and temperature 300K. Container A is heated to 373 K while container B is cooled to 273 K. Find the final pressure of the Helium gas. (5)
- (d) (i) State **Charles's law**. (1)

- (ii) With aid of a labeled diagram, describe an experiment to verify Charles's law. (5)