OSUN STATE UNIVERSITY, OSOGBO
COLLEGE OF SCIENCE, ENGINEERING AND TECHNOLOGY
FACULTY OF BASIC AND APPLIED SCIENCES
DEPARTMENT OF PHYSICS
2020/2021 HARMATTAN SEMESTER EXAMINATION

COURSE TITLE: GENERAL PHYSICS I   CODE: PHY 101   UNIT: 3 Time: 90 Minutes

Instructions: Attempt Questions 1 – 35

Show all your workings in the space provided after each question (it will be graded) and shade option corresponding to your answer on the objective sheet

PLEASE DO NO DETACH ANY SHEET

NAME:..

MATRIC NO: .... DEPT: ....

1	A	B	C	D		13	A	B	C	D		25	A	B	C	D
2	A	B	C	D		14	A	B	C	D		26	A	B	C	D
3	A	B	C	D		15	A	B	C	D		27	A	B	C	D
4	A	B	C	D		16	A	B	C	D		28	A	B	C	D
5	A	B	C	D		17	A	B	C	D		29	A	B	C	D
6	A	B	C	D		18	A	B	C	D		30	A	B	C	D
7	A	B	C	D		19	A	B	C	D		31	A	B	C	D
8	A	B	C	D		20	A	B	C	D		32	A	B	C	D
9	A	B	C	D		21	A	B	C	D		33	A	B	C	D
10	A	B	C	D		22	A	B	C	D		34	A	B	C	D
11	A	B	C	D		23	A	B	C	D		35	A	B	C	D
12	A	B	C	D		24	A	B	C	D						

1. A stone of mass 0.6 kg attached to a string of height 0.5m, is whirled in a horizontal circle at a constant speed. If the maximum tension (force) in the string is 30N before it breaks, calculate the maximum speed of the stone. (A) 0.5 m/s   (B) 0.1 m/s   (C) 0.01 m/s (D). 5 m/s

2. An object moving with a simple harmonic motion has an amplitude of 0.02m and a frequency of 20Hz. Calculate the period of oscillation. (A) 0.01s   (B) 0.02s   (C) 0.05s   (D) 0.50s

3. A man stands at a cliff 150 m high and throws a ball vertically upward reaching a total maximum height of 620 m above the ground. Find the initial velocity of throw. (u)
(A) 99.45 m/s (B) 91.91 m/s (C) 90.95 m/s (D) 96.95 m/s

4. What is the mass of an object moving round a circle of radius 50 cm at a constant speed of 10 m/s and angular speed of 3 rad/s with a force of 30 N keeping it in motion

5. An object reached a maximum height of 10 m when thrown upward at a velocity of 30 m/s. Calculate its angle of throw to the horizontal. (A) 25^0 (B). 28^0 (C) 29^0 (D) 30^0

6. Determine the minimum size of glass tubing that can be used to measure water level, if the capillary rise in the tube is not exceed 0.3mm. Take surface tension of water in contact with air as 0.0735Nm⁻¹.
    (A) 10×10^2 mm   (B) 0.1m   (C) 100m   (D) 0.01m

7. A soap bubble 50mm diameter has internal pressure in excess of the outside pressure of 25N/m². Calculate tension in the soap film. (A) 0.156N/m² (B) 0.0156N/m² (C) 0.0156Nm⁻¹ (D) 0.156Nm⁻¹

8. The depth below the surface of oil with relative density 0.8 to produce a pressure of 120 kNm⁻² is ......
    (A) 10 m (B) 15 m (C) 5 m (D) 15000 m

9. The meniscus of mercury in the glass tube curves...................(A) upward (B) downward (C) flattened (D) none of the above

10. In the capillary rise of water, what is the angle of contact water with glass? (A) 30^0 (b) 45^0 (c) 0^0 (d) 90^0

11. A circular hole in an aluminium plate is 2.725 mm in diameter at 0.000 °C. What is its diameter when the temperature of the plate is raised to 100.0 °C (Coefficient of linear expansion for Aluminium is 23×10^{-6} /C^0) (A) 2.673 cm (B) 2.725 cm (C) 2.731 cm (D) 2.900 cm   (E) 2.623 cm

12. The temperature on Celsius and Fahrenheit scales will have the same value at T equal to ......
    (A) 40 (B) – 40 (C) 50 (D) – 50 (E) None of the above

13. A cook puts 9.00 g of water in a 2.00 L pressure cooker and warms it to 500 ° C. What is the pressure inside the container? Universal gas constant (R) = 8.31 J/mol.K.
    (A) 2.61 MPa (B) 1.61 MPa (C) 1.04 MPa (D) 2.61 GPa (E) 1.04 GPa

14. Thermal equilibrium is a situation in which two objects in thermal contact (A) would exchange energy. (B) transfer energy to one another (C) convert heat energy to another form of energy. (D) would not exchange energy by heat or electromagnetic radiation.

15. A class rep pulls a public address system (PAS) of mass 50.0 kg through a distance of 5 m, and as he exerts a force of 1.20 x 10^2 N on the PAS. How much work does he do on the PAS if inclined at 30.0° and he pulls the sled the same distance?
    (A). 5.20 x 10^2 J (B). 1.20 x 10^2 J   (C). 2.20 x 10^2 J   (D) 4.20 x 10^2 J

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16. A body moves with velocity, $\vec{v} = (5\vec{i} + 2\vec{j} - 3\vec{k})$ under the influence of a constant force $\vec{F} = (4\vec{i} + 3\vec{j} - 2\vec{k})$. Determine (P) the instantaneous power of the body. (A) 32 W (B) 16 W (C) 20 W (D) 90 W

17. A JAMBITO weighing 50.0 kg runs up the stairs of SET building in 15.0 minute, to submit his four files. If the SET building is 443m tall, what must be his average power output?
(A) $2.17 \times 10^5 J$ (B) $1.17 \times 10^5 J$ (C) $0.17 \times 10^5 J$ (D) $3.17 \times 10^5 J$

18. The bulk modulus of water is 2.1 GPa. Calculate the volume contraction of 100 mL of water when subjected to a pressure of 1.5 MPa. (A) – 0.071 L   (B) – 0.071 cL   (C) – 0.071 mL   (D.) – 0.071 Dl

19. A poultry farmer puts a bird weighing 6kg on a scale balance that contains a stiff spring. In equilibrium, the spring is compressed 1.0cm under its weight. Find the total work done on scale balance, during the compression. (A) 3.0J (B) 1.5 (C) 0.3J   (D) 9.0 J

20. A 7.2m long beam AB weighing 480N has its centre of gravity 2.4m from A. A 5.0kg mass and a 2.5kg mass are hung from the beam at 1.2m and 0.8m distance from B respectively. Calculate the position where the fulcrum is place to keep the beam in equilibrium horizontally
(A) 0.5m from A (B) 2.9m from A (C) 3.1m from B (D) 3.5m from B (E) None of the above

21. Work of 100J is done on a fly wheel thereby causing its angular speed to increase from 60rev/min to 180rev/min. Moment of inertia of the flywheel is
(A) $1.2 kgm^2$ (B) $0.83 kgm^2$ (C) $0.60 kgm^2$ (D) $0.63 kgm^2$ (E) $0.38 kgm^2$

22. An iron casting containing a number of cavities weighs 6000N in air and 4000N in water. What is the total volume of all the cavities in the casting? A sample of iron with no cavity has $\rho = 7.87 g/cm^3$.
(A) $0.213 m^3$ (B) $0.126 m^3$ (C) $0.077 m^3$ (D) $0.025 m^3$ (E) $14 ms^{-1}$

23. A bullet is fired into an open water tank creating a hole that is a distance of 10m below the water surface. With what speed does the water emerge from the hole below.
(A) $26 m/s^2$ (B) $14 m/s^2$ (C) $10 m/s^2$ (D) $5 m/s^2$ (E) None of the above

24. If the acceleration due to gravity g at the surface of the moon is $1.70 m/s^2$ and its radius is $3.20 \times 10^6 m$, calculate the mass of the moon. Where $G = 6.67 \times 10^{-11} Nm^2/kg^2$ (A) 5.00×10^{21} kg (B) $1.00 \times 10^{21} kg$ (C) $2.61 \times 10^{23} kg$ (D) $4.75 \times 10^{23} kg$ (E) 3.00×10^{21} kg

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25. The escape velocity of a body on the surface of a planet radius R and mass M is (where G is the universal gravitational constant. (A). $\frac{\sqrt{2G}}{R}$ (B)$\sqrt{2GR}$ (C) $\sqrt{2GMR}$ (D) $\frac{\sqrt{2GM}}{R}$

26. A body of mass 10kg is on a horizontal table for which the coefficient of friction is 0.3. if a force of 80N is used to push the mass. What is the acceleration? (A) 8.0 m/s ^{2} (B) 5.0 m/s^2 (C) 4.2 m/s^2 (D) 21.2 m/s^{-2}

27. A force of 12N acts for 5s on a mass of 2kg. What is the change in momentum of the mass?
    (A) 60Ns (B) 40Ns (C)32Ns (D) 45Ns

28. At what temperature does a thermometer calibrated on Fahrenheit scale read half of that of a thermometer calibrated on a Celsius scale? (A). -12.31 °F (B) -12. 31 °C (C) 160 °F (D) 320 °C

29. An aluminium plate, 3 mm thick has a cross-sectional area of 0.5 mm^2 and thermal conductivity k = 240 W.m-1K-1. If one face is at 40 °C while the other is at 200 °C, determine the rate of heat transfer through the plate. (A) 3. 2 KW (B) 4.6 MW (C) 6.4 W (D) 640 W

30. A 50 KJ of heat is input to a system while the system does 5 KJ of work. What is the change in the internal energy of the system? (A) 55 KJ (B) 45 KJ (C) 25 KJ (D) -55 KJ

31. Calculate the maximum possible efficiency of a heat engine operating between the temperatures limits 50 °C and 450 °C. (A) 0.553 (B) 0.889 (C) 1.238 (D) 8.0

32. What is the angle between two vectors A = 2i+3j+k and B = -4i+2j-k
    (A) 10° (B) 100° (C) 1.0° (D) 110° (E) 102°

33. The study of the relationship among force, matter and motion is called -------- (A) mechanics (B) dynamics (C) kinematics (D) kinetic theory (E) motion

34. A body in a plane is moving with coordinates that varies with time as x=2.0-0.25t^2 and y =1.0t-0.025t^3. What are the coordinates and distance of the object at t = 2.0s
    A. (2.2,1.0) and 2.4m B. (22, 1.0) and 2.4 m C. (1.0,2.2) and 2.4m D. (2.4,2.2) and 1.0m E. (1.0,2.4) and 2.2m?

35. A body in a plane is moving with coordinates that varies with time as x=2.0-0.25t^2 and y =1.0t-0.025t^3. What is the and average velocity vector during the interval from t=0.0s to t=2.0s (A) -0.5i + 1.1j (B) 0.5i + 1.1j (C) -0.5i + 11j (D) 5i + 1.1j E. 5i + 11j