WORK SHEET

Q.1 A rolling disc having linear acceleration a and angular acceleration α is placed on a moving surface. The surface is moving with acceleration a_s as shown in the image. The disc will be in pure rolling, when



Q.2 The load versus elongation graph for four wires made of the same material and having the same length is shown in the figure. The thickest wire is represented by the line



Q.3 Two wires of the Young's moduli Y and 2Y having lengths 2L, L and radii 2R, R respectively, are joined end to end as shown in the image. The elastic potential energy stored in the system in equilibrium, is



Q.4 The capillary action for various liquid-solid pairs is given below.Match the correct meniscus, angle of contact and what happens to the level of liquid.

| Meniscus | | An | gle of contact | Level | | |
|----------|---------|-------|-----------------------|-------|-----------------|--|
| (A) | Concave | (i) | $\theta > 90^{\circ}$ | (a) | Fall | |
| (B) | Plane | (ii) | $\theta > 90^{\circ}$ | (b) | No rise or Fall | |
| (C) | Convex | (iii) | $\theta > 90^{\circ}$ | (C) | Rise | |

$$(\mathbf{A})(\mathbf{A}) \rightarrow (\mathbf{i}\mathbf{i}\mathbf{i}) \rightarrow \mathbf{c} \qquad (\mathbf{B})(\mathbf{B}) \rightarrow (\mathbf{i}\mathbf{i}\mathbf{i}) \rightarrow \mathbf{a} \qquad (\mathbf{C})(\mathbf{A}) \rightarrow (\mathbf{i}\mathbf{i}) \rightarrow \mathbf{c} \qquad (\mathbf{D})(\mathbf{C}) \rightarrow (\mathbf{i}\mathbf{i}) \rightarrow \mathbf{a}$$

- Q.5 Which of the following is not true according to Kinetic Theory of Gases?
 (A) Ratio of volume of the gas to volume occupied by the molecules is negligible.
 (B) Molecules are in continuous motion.
 (C)Molecules have kinetic energy.
 (D) The system of molecules, either gains or losses energy during collisions.
- **Q.6** A bimetallic strip consisting of metals **X** and **Y** of equal length, is heated to temperature **T**. The shape of the bimetallic strip is deflected to form an arc as shown in the image. If α and β are the coefficients of linear expansions of metals **X** and **Y**, then



- Q.7 Determine the water equivalent of 4. 5 kg of antimony. Take specific heat of antimony and water is
 0. 210 kJ/kg K and 4. 20 kJ/kg K respectively.
 (A) 0.225 Kg
 (B) 0.208 Kg
 (C) 0.325 Kg
 (D) 0.608
- Q.8How much heat must be removed by a refrigerator from 4 kg of water at 70° C to convert it to ice
cube at = -10°C? [Take specific heat of water $C_w = 4200 \text{ J/kg/°C}$, Latent heat of fusion of ice $L_f =$
334000 J/kg, Specific heat of ice $C_i = 2100 \text{ J/kg K}$]
(A)3521 kJ (B)2596 kJ (C)2352 kJ (D) 4200 kJ
- **Q.9** A gas undergoes a cyclic process as shown in the P V diagram. For one complete cycle, choose the correct option among the following.



(B)Change in internal energy = 0, heat supplied > 0

(C)Change in internal energy > 0, heat supplied < 0

(D)Change in internal energy < 0, heat supplied > 0

Q.10 Work done in the cyclic process shown in the figure is –



Q.11 An ideal gas is taken from state **A** to the state **B**, as shown in the **P** – **V** diagram. The work done in the process is



Q.12 A thermodynamic system undergoes cyclic process **ABCDA** as shown in figure. The work done by the system during one complete cycle is



Q.13 P – V diagram of an ideal gas is shown in the figure. Work done by the gas in process ABCD is



Q.14 A container made up of insulating material contains 4 moles of an ideal diatomic gas at temperature T. Heat Q is supplied to this gas, due to which 2 moles of the gas are dissociated into atoms, but the temperature of the gas remains constant. Find the option that correctly represents the relation between Q and T ?

(A)
$$Q = 2 RT$$
 (B) $Q = RT$ (C) $Q = 3RT$ (D) $Q = 4RT$

Q.15 If 2 moles of an ideal monoatomic gas at temperature T_0 is mixed with 4 moles of another ideal monoatomic gas at temperature $2T_0$ in a closed vessel, then the temperature of the mixture is

(A)
$$\frac{5}{3}$$
To (B) $\frac{3}{2}$ To (C) $\frac{4}{3}$ To (D) $\frac{5}{4}$ To

Q.16 In the figure, **n** moles of a monoatomic ideal gas undergo the process **ABC** as shown in the **P** – **V** diagram. The process **AB** is isothermal and **BC** is isochoric. The temperature of the gas at **A** is **T**₀. Total heat given to the gas during the process **ABC** is measured to be **Q**. Heat absorbed by the gas in the process **BC** is.



- **Q.17** The terminal speed of a sphere of gold (density = 19.5 g/cm^3) is 0.2 m/s in a viscous liquid (density = 1.5 g/cm^3). Find the terminal speed of a sphere of silver (density = 10.5 g/cm^3) of the same size in the same liquid (in m/s).
- **Q.18** A clock with an iron pendulum keeps correct time at **20°C**. If temperature is changed to **40°C**, then which of the following is/are true? [Take $\alpha = 0.000012/°C$] (A)Pendulum will gain 1.2 × 10⁻⁴ seconds per each second. (B)Pendulum will lose 1.2 × 10⁻⁴ seconds per each second.

(C)Pendulum will gain 10.368 seconds/day.

(D)Pendulum will lose 10.368 seconds/day.

Q.19 An ideal gas can be expanded from an initial state to a certain volume through two different processes:

(i) PV^2 = constant and (ii) P = KV^2 , where K is a positive constant. Then:



(A) Final temperature in (i) will be greater than in (ii).

(B)Final temperature in (ii) will be greater than in (i).

(C)Heat supplied in process (ii) is less than heat supplied in process (i).

(D) Heat supplied in process (ii) is greater than heat supplied in process (i).

Q.20 One mole of an ideal monoatomic gas is taken from A to C along the path ABC. The temperature of the gas at A is T₀. For the process ABC, which one of the following options(s) is/are correct?

| WORK SHEET | | | | | | | | | | |
|------------|---|---|---|---|---|---|---|---|---|----|
| Q. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |



(D) Heat absorbed by the gas is $\frac{13}{2}$ RT₀.

ANSWER KEY

| Sol. | (A) | (A) | (D) | (C) | (D) | (A) | (A) | (B) | (A) | (C) |
|------|-----|-----|-----|-----|-----|-----|-----|----------|----------|----------|
| Q. | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| Sol. | (D) | (D) | (C) | (B) | (A) | (A) | | (B), (D) | (B), (D) | (A), (C) |