6.

Consider a spherical metallic shell of inner radius r_1 and outer radius r_2 with no charge inside the shell cavity. When Q charge is placed on the metallic shell the charges will be distributed over the metallic shell and create an electric field around it. If we increase the charge on the metallic sphere to 2Q, what will happen to the electric field at the center?

A) It will increase

B) It will decrease

C) It will be zero and remains constant

D) It depends on absolute value of charge

Mark only one oval.

- A
- B
- C
- D

7.

A stone is thrown upwards at an angle θ. If the resistance due to air is neglected, which of the following will be constant during the motion of the stone.

Mark only one oval.

- Horizontal displacement
- Vertical velocity
- Acceleration
- Vertical displacement

8.

If a metallic spherical shell of radius R is charged with Q positive charge, which of the following statements is true?

Mark only one oval.

- The electric field anywhere inside the shell will be zero.
- The electric field outside the shell at a distance Z from the surface is inversely proportional to Z.
- The field at the centre of the shell will be the same as at the surface.
- The electric field inside the shell will be uniform but not zero.

9.

What is the speed of light inside a glass slab with refractive index 1.5

A) $1.5 \times 10^8 m/s$

B) $2 \times 10^8 m/s$

C) $3 \times 10^8 m/s$

D) $4.5 \times 10^8 m/s$

Mark only one oval.

- A
- B
- C
- D

10.

The time period of light of wavelength 600 nm is,

A) 2 ns **B) 2 fs** **C) 2 as** **D) 2 ps**

Mark only one oval.

- A
- B
- C
- D

11.

The minimum number of wires required at the output of a 3 phase generator is

Mark only one oval.

- 2
- 3
- 4
- 5

12.

Which of the following is not true for a step-up transformer?

A) $V_s > V_p$ **B)** $I_p > I_s$

C) $N_p/N_s > 1$ **D)** $V_sI_s = V_pI_p$

Mark only one oval.

- A
- B
- C
- D

13.

Induced emf produced in a solenoid will be,

A) equal to applied emf

B) opposite to that of applied emf

C) zero for ac current

D) proportional to the dc current

Mark only one oval.

- A
- B
- C
- D

14.

An example of transducer used for converting electrical energy to mechanical energy is

Mark only one oval.

- loud speaker
- dc generator
- incandescent lamp
- electromagnet

15.

Which of the following statements is not true?

A) The centre of mass of an object will never be outside the body

B) The centre of mass and centre of gravity will coincide for objects in a uniform gravitational field.

C) The centre of gravity of an object is the point where total weight of the object is acting

D) The torque due to gravity about the centre of gravity of an object is zero.

Mark only one oval.

- A
- B
- C
- D

Questions 11-20

16.

What is the escape velocity from Earth?

A) 11.2 km/s

B) 11.2 km/hr

C) 11.2 m/s

D) 11.2 m/hr

Mark only one oval.

- A
- B
- C
- D

17.

When a stone is dropped from the window of a train at rest, the time taken to reach ground is t. If another stone is dropped, when the train is moving with a horizontal velocity v, the time taken will be,

A) Greater

B) Lesser

C) Same

D) Proportional to $\sqrt{v}$

Mark only one oval.

- A
- B
- C
- D

18.

Certain neutron stars are believed to be rotating at 1 rev./s. If such a star has a radius of 20km, the acceleration of an object on the equator of the star will be approximately,

A) 20×10^8 m/s^2

B) 4×10^{11} m/s^2

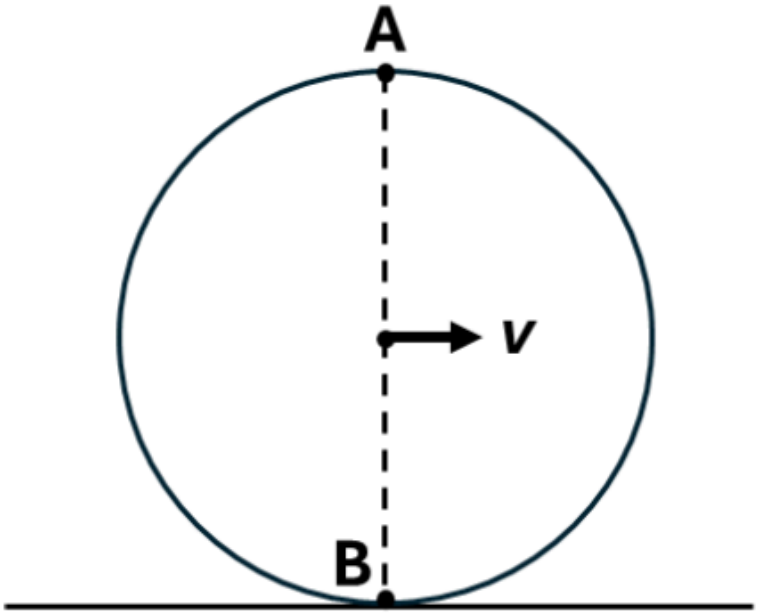
C) 8×10^5 m/s^2

D) 120×10^5 m/s^2

Mark only one oval.

- A
- B
- C
- D

19.



When a wheel is rolling over a horizontal surface, the centre of the wheel is moving with velocity v. The velocity of the points A and B with respect to the road at the instant shown in the figure are,

A) $v_a = v, v_b = 0$

B) $v_a = 0, v_b = v$

C) $v_a = v, v_b = v$

D) $v_a = 2v, v_b = 0$

Mark only one oval.

- A
- B
- C
- D

20.

A block of mass 4 kg is moving on a rough surface with a speed of 2 m/s. It comes to rest after 2 seconds. If the same block is to be kept moving with uniform velocity of 3 m/s without stopping, what will be the force that should be exerted on it?

Mark only one oval.

- 4N
- 6N
- 8N
- 10N

21.

Two masses m_1 and m_2 are moving with equal kinetic energies. If the masses are in the ratio $m_1/m_2 = ¼$, the ratio of the magnitudes of their linear momenta is

Mark only one oval.

- 4:1
- 1:2
- 2:1
- 1:16

22.

When, body of mass m is moved through a circular path with a constant angular velocity, the angular momentum observed is J. If the radius of rotation is halved without changing the angular velocity, the angular momentum will become,

A) J/4 **B) J/2**

C) 2J **D) 4J**

Mark only one oval.

- A
- B
- C
- D

23. **Which among the following is the best to be used as an insulator?**

Mark only one oval.

- Ice
- Glass wool
- Concrete
- Wood

24.

A heat engine operating between 2100 K and 700 K is presently working at an efficiency of 40%. If this efficiency is n% of its maximum possible efficiency, what is the value of n?

Mark only one oval.

- 100
- 60
- 50
- 40

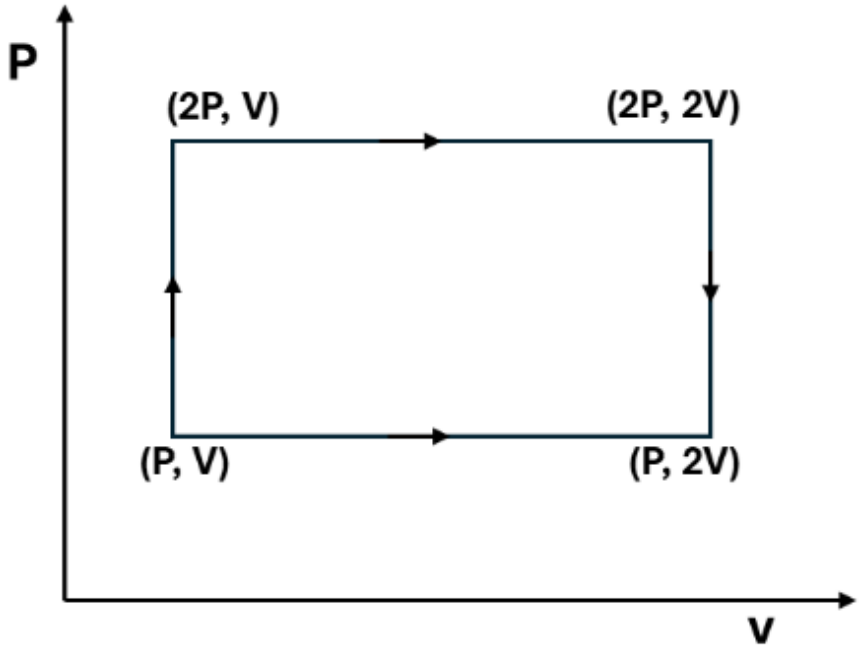
25. **Thermodynamic process in which no exchange of heat from the system takes place is called,**

Mark only one oval.

- Isothermal
- Adiabatic
- Isobaric
- Isochoric

Questions 21-30

26. **A thermodynamic system undergoes a cyclic process as shown in figure. The total work done in one cycle is,**

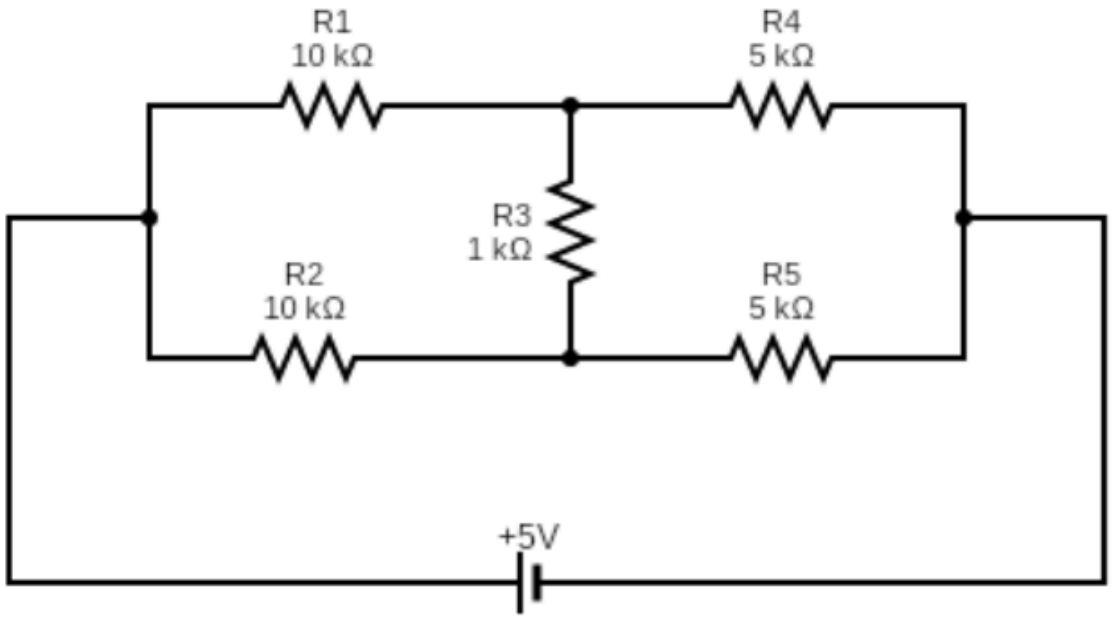


Mark only one oval.

- 0
- PV
- 2PV
- 4PV

27.

In the following circuit, if the current through R2 and R4 are marked as I_2 and I_4 respectively, calculate the ratio I_2/I_4



Mark only one oval.

- 0
- 0.5
- 1
- 2

28.

Which of the following is incorrect for PN junction diodes?

A) Charge is conserved in the depletion region.

B) The charge on the P type side of the junction is due to positive ions

C) The electric field created at the junction controls the flow of charges across the junction

D) Drift current flows through the junction under reverse bias condition

Mark only one oval.

- A
- B
- C
- D

29.

A straight current carrying conductor is kept at an angle 30° with respect to a uniform magnetic field of intensity 0.15 T. If the wire experiences a force per unit length of 0.6 N/m, what will be the current flowing through the conductor?

Mark only one oval.

- 2 A
- 4 A
- 8 A
- 9 A

30.

When Young's double slit experiment is performed under water, a fringe width of 3 mm is observed. If the same experimental setup is used to repeat the experiment in vacuum, what will be the fringe width?

A) 2.25 mm B) 3 mm C) 4 mm D) 6 mm

Mark only one oval.

- A
- B
- C
- D

31.

When a capacitor with capacitance C is charged with a cell having voltage V, the charge stored in it is Q_0. If two capacitors of same capacitance C are connected in series, with the same cell, the corresponding voltages in it will be V_1 and V_2 and charge stored will be Q_1 and Q_2 respectively. In this case which of the following is true?

Mark only one oval.

- A: $V_1 = V_2 = V$
- B: $\frac{V_1+V_2}{2} = V$
- C: $Q_0 = 2CV_2$
- D: $Q_0\left(\frac{1}{V_1} + \frac{1}{V_2}\right) = C$

32.

In a distant planet, where there is no atmosphere, when a projectile is thrown up with an initial velocity of 60m/s it took 4s to reach its maximum height, if g is the acceleration due to gravity in the planet, what will be the velocity of the projectile when it reaches the surface of the planet?

Mark only one oval.

- 0 m/s
- 15 m/s
- 20 m/s
- 60 m/s

33.

A plano-convex lens with a convex surface and a plane surface has a focal length of 20 cm and refractive index 1.5. If the plane surface is silvered, at what distance from the lens will the light rays focus?

Mark only one oval.

- 5 cm
- 7.5 cm
- 10 cm
- 20 cm

34.

An electric motor is required to lift a 500kg load. What is the minimum power required from the motor, if the load is to be lifted to 20 metre height in 5 seconds? Consider g=10 m/s^2.

Mark only one oval.

- 5 kW
- 10 kW
- 20 kW
- 50 kW

35.

Which of the following objects with the same mass and radius, have the same moment of inertia about their principal axis?

A) Circular Ring and sphere

B) Circular Disc and solid cylinder

C) Circular ring and circular disc

D) Hollow cylinder and solid cylinder

Mark only one oval.

- A
- B
- C
- D