2025 PRELIMINARY EXAMINATION
SUGGESTED ANSWER SCHEME

PAPER 1 (40 marks)

Qn	Ans	Explanation
1	**B**	Options C and D are not in the range of the micrometer screw gauge. Diameter of an atom is measured using an electron microscope
2	**B**	Density of cork = (4.8 g) / (80 – 56) cm^3 = 0.20 g/cm^3
3	**C**	Resultant force should originate from the same point as the two component forces. D is wrong as it acts in the opposite direction to the resultant force.
4	**D**	Area under v-t graph for X = area under v-t graph for Y in 5 s.
5	**B**	X and Y represents the area - X is the height reached after rebounding , Y is the same height dropped just before impact
6	**A**	Earth exerts an attractive force (weight - action) on box ; Box exerts an equal bit opposite force (reaction) on Earth.
7	**B**	Two opposing forces of the same magnitude produces a zero resultant force and since the object is already in motion, it will continue in its state of motion at a constant velocity
8	**D**	Pressure of gas = 101 kPa + (0.212 x 10 x 1000) Pa = 103120 Pa = 103 kPa (3 s.f.)
9	**C**	Force is the same at the sharp point. Due to the small area of the sharp point, pressure (force/area) will be greater than on the flat surface which has a larger area.
10	**D**	Moment must be taken about the same point (i.e. pivot) for an object in equilibrium
11	**B**	Tension in wire x 30 cm $\sin 40^o$ = 5.2 N x 15 cm Tension in wire = 4.044 N = 4.0 N (2 s.f.)
12	**A**	$KE_Y = ½ (m_Y)(v_Y)^2$; $KE_X = ½ (2m_Y)(v_Y/2)^2 = (m_Y v_Y^2)/4 = ½ KE_Y$
13	**C**	A – KE is zero ; B – EPE is zero ; D – KE is zero
14	**C**	Efficiency = (100 x 10^6 W)/ (1.5 x 10^5 kgs^{-1} x 10 N/kg x 120 m) x 100% = 55.5 % = 56% (2 s.f.)
15	**C**	Specific heat capacity definition

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16	**D**	P speaks of the bombardment of molecules at the surface by molecules below; Thermal energy is supplied to the water molecules by the body as it is at a higher temperature ; the drawing of thermal energy from the face cools the face
17	**C**	Q = (0.11 x 1000 g) x 334 J /g = 36740 J = 37000 J (2 s.f.)
18	**C**	Atoms are not mobile and cannot expand. Electrons will have collision with atoms as they move to the cooler end of the rod.
19	**D**	Glass is poor thermal conductor as it does not transfer thermal energy quickly from the heated end ; convection is confined at the top and water is a poor thermal conductor
20	**D**	In electrostatic induction, only negative charges (electrons) are mobile. By the conservation of charge, the amount of negative charge induced is equal to the amount of positive charges hence the sphere is neutral even during electrostatic induction.
21	**C**	The direction of the electric field is the direction a (free) positive charge will move when place at P. Since X is negatively charged, the positive charge will move from P to X, hence the direction.
22	**C**	Diode allows current to flow in one direction. It will cut off the negative half of the a.c.
23	**B**	Both lamps were at same brightness before closing switch. After closing, total resistance dropped leading to a higher current. L_1 has a larger current compared to L_2. So L_1 becomes brighter while L_2 dims.
24	**B**	Applying potential divider equation A: $V_{output} = 4.5\ V$; B: $V_{output} = \frac{2X}{3X} 9.0\ V = 6.0\ V$; C: $V_{output} = \frac{2X/3}{5X/3} 9.0\ V = 3.6\ V$; D: $V_{output} = 9.0\ V - \frac{2X/3}{5X/3} 9.0\ V = 5.4\ V$
25	**A**	$V_Q = (2.0 - 0.5)V$; $I_P = (2.0A - 0.5A) = 1.5\ A$
26	**C**	Radio wave has the longest wavelength
27	**D**	v = 2.0 Hz x 2 m = 4.0 ms^{-1}. At t= 0.5 s, the distance moved by the waveform is 2.0 m (1 wavelength)
28	**D**	v = (1/0.5) (60 cm) = 120 cms^{-1}
29	**C**	Speed of sound through solid is the highest.
30	**B**	Only for object distance f <u < 2f can a real enlarged image.

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31	**B**	By ray construction, Image of Q and T can still be seen by the eye at E.
32	**C**	C still attracts the most number of clips(3) after the magnet is removed
33	**D**	Actions describes in A, B and C disturbs the magnetic domains and cause the little magnets in the domains to disorientate. Passing a direct current will align the domains inside the steel bar and it will become a permanent magnet.
34	**C**	Applying Fleming's LHR. No rotation for diagram 1 as there is a restoring force when the coil reaches the vertical
35	**B**	A -electron beam deflected to the bottom of page. (Fleming's LHR) C – electron beam deflected to top of page D – electron beam to the left of page.
36	**C**	Diagram 1 : X is an induced S-pole when the magnet approaches. As the N-pole recedes away from the coil, a S-pole is induced at the bottom of the coil. Hence X will be a N-pole (Lenz's law)
37	**C**	Output will be high voltage low current to minimize power loss. Since power loss = I^2R , resistance of cables will be small when cross sectional area is large.
38	**B**	Both processes result in energy release.
39	**D**	Gamma radiation pass through aluminium and is not deflected by magnetic and electric fields
40	**B**	Background radiation accounts for the 20 counts per min