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2015 O level Pure Physics 5059 Paper 1 (MCQ) Suggested Answers

Question	Answer	Explanation
1	C	Diameter of Earth is approx. 13 x 10^6. Diameter of a hydrogen atom is approx. 1 x 10^{-10} m.
2	D	Vector quantities **MUST** include direction. Both velocity and weight (a force) has direction.
3	B	Option A: Resultant greater than 4 N Option C: Resultant greater than 4 N Option D: Resultant is 2 N
4	D	For every oscillation, the pendulum will pass through the point Y **twice**. The first time the pendulum passes through point Y must be discounted from the total number of times it passes through Y (21 times) as that first pass-through does not contribute to any of the timed oscillations. T is the total time taken for 10 oscillations, hence 1 period must be T/10.
5	B	Initially the box experiences acceleration of 10 m/s^2. As it falls, acceleration decreases due to the increase in air resistance. Terminal velocity is reached after some time as air resistance = weight of the box. Graph 1 & 4 illustrate this explanation.
6	C	Based on Netwon's third law, for every action, there is an equal and opposite reaction
7	D	F = ma (Driving force – frictional force) = mass x acceleration Driving force – 1200 = 800 x 2.5 Driving force = 3200 N
8	C	Inertia is the reluctance of a body to change its state of motion. The greater the mass, the greater the inertia.
9	C	(**Students need to take note of the units before calculating**) Volume = mass/ density => 5000 g/ 2gcm^{-3} = 2500 cm^3
10	D	Center of gravity of an irregular object must be at the heavier side.
11	D	Pressure of the water at the base = hpg = 2x1000x10 = 20,000 Pa F = P x A = 20 000 x 4 = 80 000 N
12	B	Efficiency = $\frac{\text{useful energy output}}{\text{total energy input}}$ x 100%
13	A	Total energy at the start = GPE = 1600 kJ Total energy at the end = KE = 0.5(2000)$(30)^2$ = 900 kJ Energy lost = 1600 – 900 = 700 kJ
14	B	Kinetic Particle Theory: the random motion of the specks is due to the smoke particles being bombarded by the air particles. An increased temperature would lead to an increase in kinetic energy of the particles.
15	A	P ∝ T, V ∝ T, P ∝ $\frac{1}{V}$
16	B	Conduction through solids & convection through liquids.
17	A	Dull black surface is a good radiator of thermal heat energy. Though option C is also a dull black surface, covering the can with a lid slows down heat loss via convection.
18	A	Let the final temperature of the water be p ^oC. Since both are water, they will have the same specific heat capacity. Heat lost by 1 kg of water = Heat gain by 5 kg of water $m\theta = m\theta$ 1 x (80 – p) = 5 x (p – 20) p = 30 ^oC
19	B	Mixture of liquid and solid → substance is melting.
20	A	L = Q / m where Q is the amount of energy and m is the mass. => Since electrical energy is given, from the formula, L = Q / m, mass of ice is required in order to find the specific latent heat of fusion.

21	C	Known Fact
22	A	12 wavelengths => 60 s 1 wavelength => 5 s f = 1/ T = 1/5 = 0.20 Hz
23	C	As water moves from deep region to shallow region, this will cause a decrease in speed and decrease in wavelength.
24	C	Sound waves are longitudinal and Option A, B and D are transverse waves.
25	A	Since $n = \frac{\sin i}{\sin r}$, therefore sin i = n sin r. So sin i will be directly proportional to sin r. In options B and C, sin i and sin r are inversely proportional. In option D, the gradient of the line is less than 1, which is not possible as n = 1 for vacuum.
26	C	Converging lens **focuses/converges** light rays to a point called the focal point. Only rays in Option C will meet at a point.
27	B	Image is formed behind the object/ on the same side as the object. Therefore, object must be in front of the focal length. Hence Options A and D are wrong. Using similar triangles, we get $\frac{h_i}{h_o} = \frac{d_i - f}{f}$, where h = height, d = distance from centre of lens, i = image and o = object. Solving this equation f = 3.0cm.
28	A	v = f λ, λ = v/f = 1400 m/s ÷ (2 x 10^6) = 7.0 x 10^{-4} m
29	A	Distance travelled = speed x time taken. Since time taken is between transmitting and receiving the signal, distance travelled is doubled, which must then be halved to get the answer. Time to transmit only = 0.40s / 2 = 0.20 s 1500 x 0.20 = 300 m
30	A	When X is brought close to Y, the side of Y nearer to X is induced with negative charges and the right side of sphere Y is made up of positive charges. When sphere Y is earthed, electrons from Earth flow into Y to neutralize positive charges in Y. When X is moved far away, sphere Y becomes negatively charged.
31	C	I = Q/t = 60/ 15 = 4 A
32	B	Resistors in parallel have the least effective resistance while resistors in series have the greatest effective resistance. Network W = 4 Ω, network X = 40 Ω , network Y = 25 Ω
33	C	Current through 1 ohm resistor => 5 + 2 = 7A (total current) p.d across 1 ohm resistor = I x R = 5 x 1 = 5V p.d across 1 ohm resistor = p. d across 2.5 ohm resistor Total p.d = voltmeter reading = 5 + 7 = 12 V
34	D	Light intensity increases => resistance of LDR drops => Current in the circuit increases => ammeter reading increases. Since the circuit is in series, if the current in the circuit increases, voltage reading across the resistor also increases.
35	B	60 W = 0.06 kW In 10 hours: 0.06 x 10 = 0.6 kWh Cost = 0.6 x 0.3 = $ 0.18
36	D	Live wire connects directly to the switch, neutral wire completes the circuit and earth wire connects to the metal casing.
37	C	Magnetic field must be in one direction and only option C shows this.
38	D	For an induced current to be produced, the coil must cut the magnetic field lines of the magnet. In a vertical position, the magnetic field lines are not being cut by the coil. This happens when one side of the coil is at the top or bottom of its turn.
39	A	Current in the secondary coil => 12V/ 8 = 1.5 A $\frac{V_p}{V_s} = \frac{I_s}{I_p}$ & $\frac{240}{12} = \frac{1.5}{I_p}$ => $I_p = 0.075A$
40	D	From the graph, 1 period = 4 cm 4 cm ⇒ 0.020 s 1 cm ⇒ 0.020 / 4 = 5 ms