Ngee Ann Secondary School 2024 Sec 4 Science (Physics, Chemistry) (5086) Prelim Paper 1 (Physics component)

1	Α	6	Α	11	Α	16	Α
2	D	7	D	12	С	17	С
3	С	8	В	13	В	18	D
4	В	9	С	14	Α	19	В
5	D	10	С	15	D	20	С

Qn	Solution	Ans
1	Vector quantities are quantities with both magnitude and direction only. From the list given, the vector quantities are: force, acceleration, velocity, moment.	Α
2	Time taken by the car to travel a distance of 800 m = 2 min 1 sec - 1 min 35 sec = 61 - 35 = 26 s Average speed = distance travelled / time taken = 800 / 26 = 31 m / s (2 sf)	D
3	Concept: Gradient of speed-time graph = acceleration. Hence, the section that corresponds to uniform acceleration will be the section of the speed-time graph with constant gradient (a straight line graph) Uniform acceleration = gradient of straight line graph between time = 2 s and time = 3 s = $(20 - 10) / (3 - 2)$ = 10 m / s ²	С

4	Mass is the amount of matter in a body. Since there is no change in the amount of matter in the astronaut at all times, the mass is a constant, regardless of location. From surface of Earth to the space, the gravitational field strength of Earth decreases. Since weight = mass x gravitational field strength, the weight will decrease.	В
5	Both the watermelon and the durian have the same mass and hence the same weight. The force exerted by the durian on the plastic bag will be equal to that exerted by the watermelon on the plastic bag. But the surface area of contact between the watermelon and plastic bag is larger than that between the durian and plastic bag. Since pressure = force / area, the pressure exerted by the durian on the plastic bag will be larger and hence the plastic bag is likely to tear.	D
6	The resultant of the three forces is zero. But since the object is already in the state of motion and moving to the right before the three forces applied, by Newton's 1 st Law, the object will continue to move with a constant speed along a straight line (and in the same direction).	Α
7	There is no other force acting on the toy, except weight of the toy. Hence, in order for the toy to be balanced, the line of action of weight of the toy should pass through the support so that the moment due to the weight of the toy will be zero (and does not cause any turning effect). Hence, centre of gravity of the toy should be at point D.	D
8	Work done = force x distance travelled in the direction of the force = $2000 \times (5.0 \times 10^3)$ = 10 000 000 J = 10 MJ	В
9	Since particles are close together and moving past each other at random, this tells us that the substance is in a state of liquid. Hence, the substance is changing from liquid to gas. During the change in the state of matter, the temperature is a constant. Hence, the internal kinetic energy of particles will be constant.	С

10	Sound wave is a longitudinal wave. The direction of particle motion is parallel to the direction of wave motion, and the particle is moving about their undisturbed position.	С
11	For point X to travel back to its original position, the total time taken required = $4 \times 0.2 = 0.8 \text{ s}$	
	Note: (1) Rope can only produce transverse wave. (2) wavelength of the wave is 4 m. (3) speed of the wave = 4 / 0.8 = 5.0 m / s	Α
12	This is a recall question on the trend of the EM waves arranged in terms of increasing frequency, and the application of ultraviolet rays. Note: Infra-red is used for TV remote controller	С
13	refractive index = speed of light in vacuum / speed of light in medium = 3.0×10^8 / (1.97×10^8) = 1.53 Since light travels from air into block, using n = sin i / sin r $1.53 = sin 40^\circ$ / sin r, r = 25°	В

14	For point J, when current is zero and p.d is non-zero, using $R = V / I$,	
	this means that the resistance must be large.	
	5	
	To compare K and L, we can have use some fictitious values as follows	
	to compare the current and p d:	
	to compare the current and p.d.	
	8 4 1 -	
	current /	
		Α
	K / I	
	о р.d.	
	Therefore, resistance at K = 1 unit	
	and resistance at L = 1.5 / 8 < 1 unit.	
	Hence, resistance at L is the smallest.	
15	All the light bulbs and the voltmeter are connected parallel to the	
	battery. Hence, regardless what happens to the other light bulbs, the	
	p.d across each light bulb and the voltmeter is always equal to e.m.f of	
	battery. Hence, there is no change to the voltmeter reading at all times.	
	Using $R = V/I$ since R and V are the same for all the light hulbs the	D
	current flowing through each light hulb will be the same. Hence, with	
	and light hulb become foulty there will be lesser current flowing	
	one light build become lauity, there will be lesser current llowing	
	through the ammeter. Hence, ammeter reading will decrease.	
16	Power of TV in kW = 300 / 1000 = 0.30 kW	
	Total energy in kWh	
	= power in kW x Time in hour	
	$= 0.30 \times 5$	Α
	= 1.5 kWh	
	Cost in using the TV = $1.5 \times 30 = 45$ cents.	
17	Switch must be placed along the live wire.	
	Device is connected between the live wire and the neutral wire.	С
	Earth wire is connected to the metal casing.	

18	In the diagram, we have the following:	
	(1) magnetic materials are nickel, steel.	
	(2) non-magnetic materials are brass and copper.	D
	Therefore, the pair that can be attracted to magnet is option D.	
19	Using right hand grip rule on the solenoid, the left end of the solenoid is a N-pole and hence the right end of the solenoid is S-pole. Hence, the conductor is experiencing a magnetic field (due to the current in the solenoid) and the direction of this magnetic field is pointing to the left. Using Fleming's Left Hand Rule, the force acting on the conductor will be pointing in the direction of B.	В
20	Source A will undergo a total of four cycle of half-lives within an hour. The count per second at 9.00 am = 400 x (1/2) x (1/2) x (1/2) x (1/2) = 25 Source B will undergo a total of three cycle of half-lives within an hour. The count per second at 9.00 am = 400 x (1/2) x (1/2) x (1/2) = 50 Source C will undergo a total of two cycle of half-lives within an hour. The count per second at 9.00 am = 400 x (1/2) x (1/2) = 100 Source D will undergo a total of one cycle of half-lives within an hour. The count per second at 9.00 am = 400 x (1/2) x (1/2) = 100	С