DSS Prelim 2019 Sc(Phy) Sec 4 E/5 N 5076

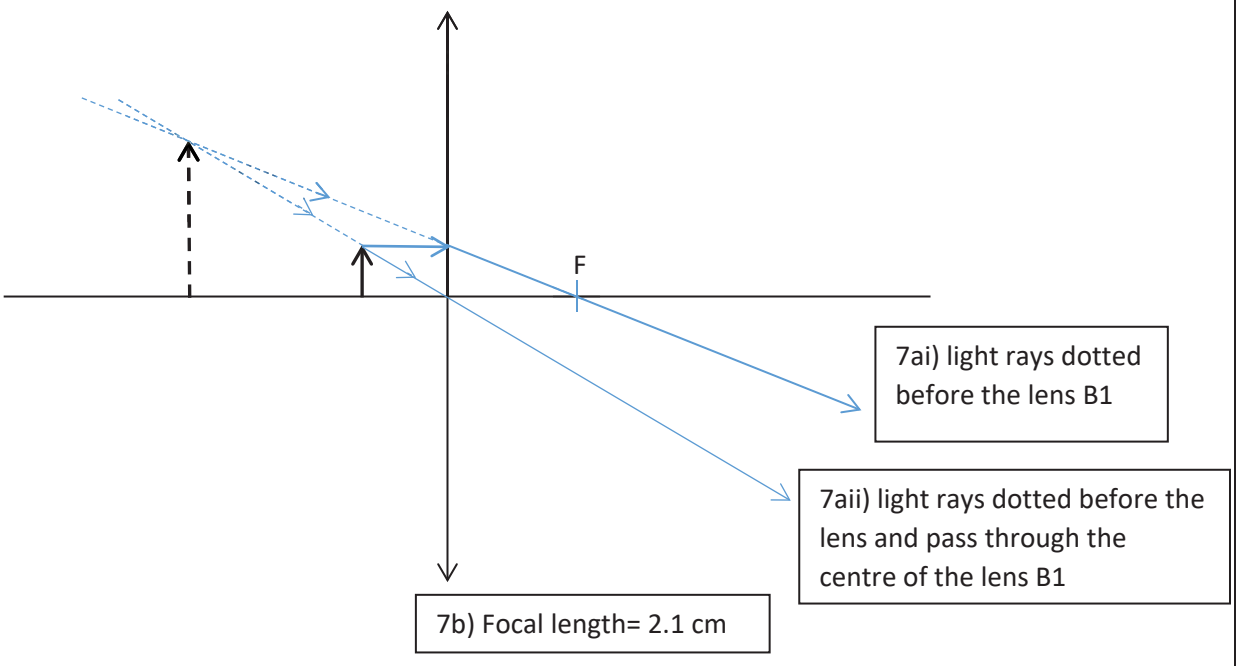
Section A MCQ

1	2	3	4	5	6	7	8	9	10
B	B	A	C	B	C	C	A	D	B
11	12	13	14	15	16	17	18	19	20
C	B	A	A	D	D	B	B	A	D

Section B

No.	Answer	Marks
1a	The heat sink is made up of metal, which is a good conductor of heat.	B1
1b	- The fins are black in colour, which is a good emitter of infrared radiation/radiant heat. *(*Zero marks if student also mentions good absorber of radiation too)* ***Or*** - The fins create a larger surface area for increased rate of emission of radiation.	B1
2a	Far apart to closely packed or Random to orderly/regular	B1
2b	move randomly at very high speeds to sliding past one another.	B1
3a	Mass of B = ρV = 1 x (3.0 x 40) = 120 g	 M1 A1
3b	Weight of B = 120/1000 x 10 = 1.2 N Pressure = 1.2/(3.0x0.0001) *(ecf)* = 4000 N/m^2	M1 A1
3c	The density of liquid A is higher than B. The pressure is the same at X and Y, hence mass of liquid A and B above points X and Y are equal. But volume of liquid A is smaller than B.	A1 M0
4a	2000 x 2.0 = 4000 Nm	 A1
4b	T = 4000/8.0 (ecf) = 500 N	M1 A1
4c	The moment increases. The perpendicular distance from the line of action of T to the pivot increases,	A1 M1

5ai	Loss in GPE = mgΔh = 80 x 10 x (28-16) = 9600 J	 M1 A1
5aii	Gain in KE = loss in GPE ½ x 80 x v^2 = 9600 v = 15.5 m/s	 M1 A1
5b	Ecf from 5a: Work done against friction = 9600-8800 = 800 J Friction x 56 = 800 Friction = 14.3 N	 M1 A1
6a	Sin 60/sin x = 1. 50 x = 35.3° (1 d.p.)	M1 A1
6b	Sin C = 1/n = 1/1.5 C = 41.8°	M0 A1
6c	y = 360-60-60-90-90-35.3 = 24.7° (1 d.p.) M0 A1	M0 A1
6d	Draw ray refracted away from the normal. (ecf from 5c)	B1
7ai aii	See diagram below. Award the marks even without arrows drawn. Dotted lines must be drawn to show virtual light rays.	B1 B1



7b	Accept 2.0 cm to 2.2 cm (2.1cm)	B1
8a	V = wavelength / Period Wavelength = V x Period = 1.5 x 5 = 7.5 m	 M1 A1
8b	Particle at P move down	B1
8c	Wave shown is a transverse wave because the particles of the wave moves in a direction perpendicular to the direction of the wave motion.	A1 A1
9a-d	Infrared radiation; Microwave Ultraviolet radiation Gamma rays	B1 (1 wrong) 0m (2 wrong)
10a	The negative charges at the bottom/ base of the cloud repels away the electrons in the ground, leaving excess positive charges. This is because like charges repel.	B1
10b	I = Q/t = 180/0.0015 = 120 000A	M1 A1
11a	When current exceeds the fuse rating flows through the fuse, the wire inside gets heated up and melts/fuse blows. This breaks the circuit.	B1
11b	Total power = 2300 + 460 = 2760 W Total I = P/V = 2760/230 = 12 A Or $I=I_1+I_2$ $= \frac{2300}{230} + \frac{460}{230} = 12\ A$ Fuse rating = 13 A	 A1 A1
12a	Arrow pointing towards the inside of the magnet.	B1
12b	increase the current *reject: Add more batteries. Use stronger magnet / use a stronger magnetic field strength	Any – 1
12c	The rod will oscillate forward and backward with a frequency of 0.5 Hz. The current direction alternates, causing the direction of the force to alternate too.	B1 B1
13ai	a = (55-40)/2 = 7.5 m/s^2	M1 A1

13aii	F = ma = 180 x 7.5 (ecf : 1m) = 1350 N	M1 A1
13bi	0 to 2.0 s : constant acceleration / accelerating at constant rate. 2.0 s to 8.4 s : decreasing acceleration / accelerate at a decreasing rate. 8.4 s to 12 s : no acceleration / constant speed First two points correct – 1m Last point correct – 1m	 B1 B1
13bii	As the motorcycle accelerates, it experiences more air resistance. This decreases the resultant force and since resultant force = mass x acceleration, acceleration decreases. The total resistive force eventually equal to the driving force, causing resultant force to be zero and hence acceleration will also be zero.	B1 B1 B1
13biii	Draw a graph with a smaller gradient, reaching a lower top speed.	B1
14ai	Sound travels through a series of compressions and rarefactions of particles. Particles vibrate parallel to the direction of wave propagation.	B1 B1
14aii	Some of the sound energy is lost to the surroundings /converted to thermal energy as it travels further to microphone 2.	B1
14b	Time = 5 intervals x 1 ms = 0.005 s d = speed x time = 330 x 0.005 = 1.65 m *penalise 1 m for not converting time to seconds	M1 M1 A1
14c	• There may be multiple echoes due to the surrounding walls. • When using the stopwatch to measure time, there could be a human reaction time error incurred. • When measuring the distance between the microphones, it is difficult to measure length of more than 1 meter accurately using a metre rule.	Any 2 - B2
14d	The traces from microphone 1 and 2 will be closer to each other. Sound travels faster in water than in air. / Smaller amplitude because some energy maybe absorbed by the water particles.	B1 B1
15ai	20 Ω	A1
15aii	Total R = 20 + 10 = 30 Ω Total I = 1.5/30 = 0.05 A Potential difference = 0.05 x 20 = 1.0 V OR Total R= 20 + 10 = 30 Ω p.d. = 20/30 x 1.5 = 1 V	 M1 A1 or M1 A1
15b	As temperature increases, the resistance of X decreases. Since emf remains constant and V = RI, the current will increase.	B1 B1

15ci	South	B1
15cii	Anticlockwise	B1
15ciii	- As the current increases, the solenoid will be magnetised more strongly / strength of induced magnetism at P increases. - The permanent magnet will be attracted more strongly / This increases the forces of attraction, - Thus pointer deflect in the anticlockwise moment about the pivot. (This causes the pointer to deflect on the scale above zero mark.)	B1 B1 B1