Sec 4E5N Express Sc(Physics) Prelim Exam Marking Scheme 2019

Paper 1 MCQ:

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

Paper 2 Section A:

1(a) **(i) AB [A1] (ii)CD [A1]**

1(b) average speed $=\frac{(15-10)km}{(1400-600)s}$ $[\boldsymbol{M1}] = \frac{5000}{800} = 6.25\ m/s$ **[A1]**

2(a) **(i)** W (with arrow) is at the centre of the rule exactly at the 50 cm mark **[A1]**

2(a) **(ii)** Using Principle of moments (50-35) x W+(80-35) x 4 = (35-10) x 8 **[M1]**
15W = 200-180 =20, W=1.33 N [**A1**]

2(b) moment arm of 4N must reduce OR move 4N towards pivot OR 0.4N position less than 80 cm mark.(any value given that is smaller) **[A1]**
As the moment arm of 0.8 N is shorter, anticlockwise moment is smaller **OR** clockwise moment caused by weight is increased, Clockwise moment of 4N must be reduced.

3(a) Volume = 0.6x0.3x0.2 = 0.036 m^3, mass = 0.036 x 25 **[M1]** = 0.9 kg **[A1]**

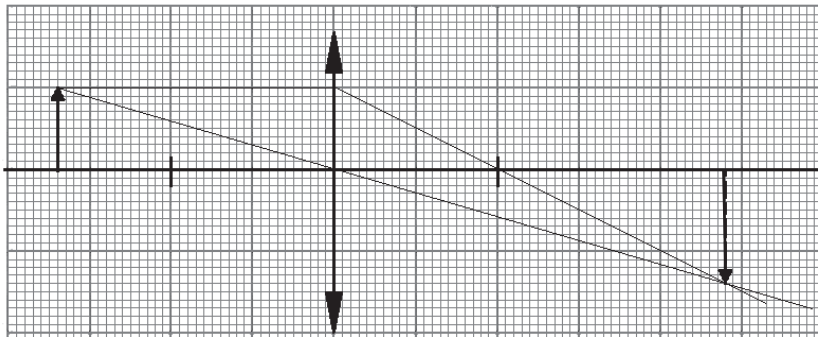
3(b) Weight = 0.9 x 10 = 9, Pressure (max) = 9/(0.3 x 0.2) **[M1]** =150 Pa **[A1]**

4(a) Water is a poor conductor of heat/ insulator so the heat cannot conduct easily from heater to Sensor Q by conduction. **[A1]**
Little convection occurs below heater at Sensor Q as heated, less dense water from heater rises above it **[A1]** while cold, more dense water replaces the risen water.
By just mentioning about convection current affecting P and Q will not get any marks.

4(b) Lower the heater down 10cm /same level as Sensor **Q** OR bottom of the beaker **[A1]**
Now heated, less dense water from heater rises above it while cold, more dense water replaces the risen water, setting up convection current **[A1]**

5(a) Molecules sliding over one another **[A1]**
Molecules gain energy and overcome intermolecular forces **[A1]**
Molecules moved further apart **[A1]**

5(b) From graph, substance is liquid at 40 °C.
The molecules are arranged in a disorderly manner/ randomly **[A1]**
The molecules can slide past one another **[A1] No mark if moving randomly.**



6(a) **(i)** image, label I [**A1**] (No mark if no label)
Connect object through optical centre lens to image **[A1]**
Connect object to lens, from lens to image [**A1**],
Note: Subtract only 1 mark for missing arrows or dotted rays or both.

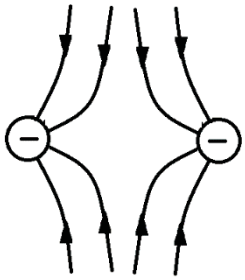
6(a) **(ii)** inverted, magnified or enlarged, real [**2 ans** correct for **A1**, 3 for **A2**]

6(a) **(ii)** projector [**A1**]

7(a) The dust particles gain electrons from the wire mesh and becomes negatively charged. **[A1]**

7(b) The negatively charged dust particles are attracted towards the positively charged metal plate.**[A1]** Like charges repel **[A1] OR** The negatively charged dust particles are repelled away from the negatively charged metal plate.**[A1]** Unlike charges repel **[A1]**

7(c) pattern must symmetrical with the neutral zone and arrow directions correct**[A1]**



8(a) v= fλ, Speed = 8000 000 x 0.04 **[M1]** = 320 000 000 m/s **[A1]**

8(b) time = (36000+44000)x 1000/320 000 000 **[M1]** ecf 8a= 0.25 s **[A1] ecf 8a**

8(c) Transmission of microwaves not affected/obstructed by cloud cover/water droplets and need no medium (in space) to transmit. **[A1]**

9(a) Pitch of Wave B higher **[A1]** than Wave A. Frequency of Wave B higher **[A1]** than Wave A, giving higher pitch

9(b) Loudness of Wave B is the same **[A1]** as Wave A. Amplitude of Wave B same **[A1]** as Wave A, giving same loudness

10(a) When current is switched on. The iron core becomes an electromagnet**[A1]**. Based on the Right hand grip, North pole is induced by the electric current flowing in the coils of wire onto the right side of the iron core **[A1]** and like poles repel.
By saying that it is North pole on the right of iron core with no reason and mentioning like poles repel will not get any mark.

10(b) The iron rod will be attracted to the iron core **[A1]** when current in turned on. Based on the Right hand grip, North pole is induced on the right hand side of the iron core which will induce an opposite pole onto the magnetic iron rod. **[A1]** Unlike poles attract.

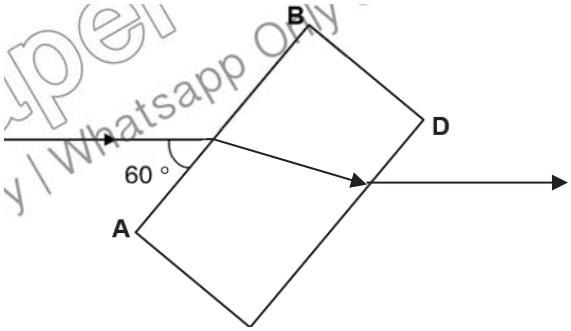
11(a) Critical angle is the angle of incidence in the optically denser medium when the angle of refraction in the optically less dense medium is 90 ° (*no optical word will be marked wrong)

11(b) Critical angle = $\sin^{-1}(1/1.42)$ **[M1]** = 44.8° **[A1]**

11(c) Angle of incidence = 90° – 60° = 30°

n of glass block = $\frac{\sin i}{\sin r} = \frac{\sin 30}{\sin r}$ = 1.42 **[M1]**, r = 20.6 ° **[A1]**

11(d) Refracted ray bend towards normal **[A1]**
Emergent ray must be // incident ray**[A1]**



11(e) When the angle of incidence in the optically* dense medium exceeds the critical angle, the light ray will no longer be refracted into the optically less dense medium and total internal reflection occurs. **[A1]** *Do not award marks if optical is missing

11(f) As the angle of incidence in the optically* dense medium does not exceed the critical angle **OR** all the incident light rays on surface AB does nto exceed 90 ° **[A1],** the light ray will always be refracted **[A1]** into the optically less dense medium and no total internal reflection occurs. *Do not award marks if optical is missing

12(a) parallel **[A1]**

12(b) $1/R_{eff}$ **=** 1/6 + 1/12 **[A1]** = 1/4 => R_{eff} = 4 Ω **[A1]**

12(c) Total Current = 6/18 = 0.333 A **[M1]**

Total resistance = 18 + 4 , emf = 0.333 x 22 **[M1]** = 7.33 V **[A1] ecf 12b,c**

12(d) potential difference = total EMF- $V_{18\ \Omega}$ = 7.33 - 6 [M1] = 1.33 V**[A1]**

Current across 12 Ω = 1.33/12 = 0.111 A **[A1] ecf 12c**

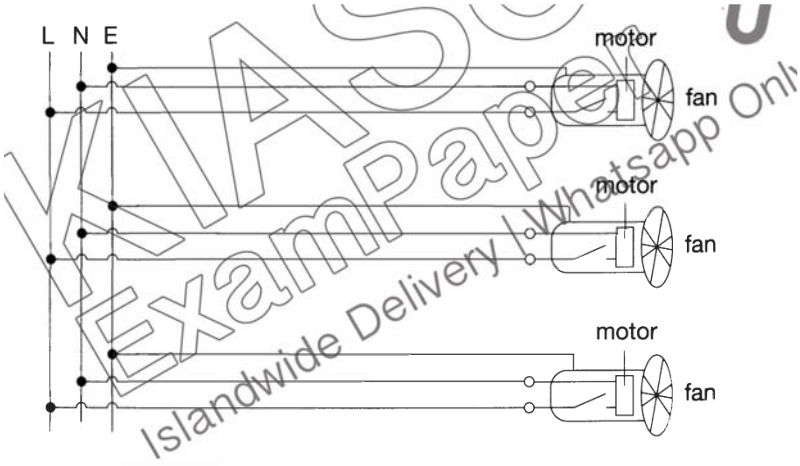
12(e) Increase Length of wire 2x doubles the resistance of wire. Reduce diameter/cross sectional area/ thinner wire by half doubles the resistance.**[A1].** For the parallel circuit, the effective resistance is calculated to be higher, thereby increasing overall resistance **[A1]** of the whole circuit.

13(a) Series connection instead of parallel connection **[A1]**

Switch is connected to neutral instead of live wire **[A1]**

The casing is not earthed/ connected to earth wire **[A1]**

13(b)



[A3]

13(c) Current for 1 fan = Power / Potential Difference

= 600 W / 200 V = 3 A **[M1]**

Current for 3 fan = 3 x 3 A = 9 A **[A1]**

13(d) Fuse **[A1]**

When the current in the circuit exceeds the current rating of the fuse, the fuse will melt or break**[A1]**, thus preventing overheating/ fire. No mark if voltage is mentioned instead.